



China Air 2019

Air Pollution Prevention and Control Progress in Chinese Cities

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Clean Air Asia

About Clean Air Asia

Clean Air Asia (CAA) is an international non-profit organization initiated by the Asian Development Bank, World Bank, and United States Agency for International Development (USAID) in 2001. It aims to improve air quality and build livable cities in Asia.

Headquartered in Manila, the Philippines, CAA has offices in Beijing and Delhi. The organization has 261 partners across the world, and its operations cover six country networks, including Indonesia, Malaysia, Nepal, the Philippines, Sri Lanka and Vietnam.

CAA has been working in China since 2002, where it focuses on air quality management and green transportation. CAA founded its Clean Air Asia (Philippines) Beijing Representative Office upon obtaining its Registration Certificate for Representative Offices of Overseas Non-Governmental Organizations from the Beijing Municipal Public Security Bureau on March 12, 2018. Under the supervision of the Ministry of Ecology and Environment and the Beijing Municipal Bureau of Public Security, CAA improves air quality through capacity building, policy research and public education across the country.

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Foreword

Dear reader,

China Air, our annual flagship series of reports, records and analyzes the progress China has made in air pollution prevention and control through the collection of information and data from government sources. The analysis examines the period that has elapsed since the Action Plan for Air Pollution Prevention and Control was released in 2013. We anticipate this series of reports will inspire society as a whole to support and supervise policy implementation, enhance mutual learning among Chinese cities, and help the international community better understand China's progress in improving air quality.

After five years of recording and tracking progress, we have found that China has begun implementing a scientific system for air pollution prevention and control, and accumulated abundant experience in multiple areas such as scientific capacity building, major pollution source control, safeguarding measures, and greater coordination and collaboration among government departments. Yet the core impetus behind China's air pollution prevention and control efforts lies in a shared determination of both the central and local governments to tackle air pollution and utilize target management and accountability mechanisms.

China Air 2019 is the fifth report of our series and covers the year 2018, the first year under China's Three-Year Action Plan for Winning the Blue Sky Defense Battle. Building on the previous four published reports, *China Air 2019* continues to summarize and analyze measures and policies on air pollution, their implementation, and changes in air quality for the country as a whole, key regions and 338 cities.

Marking a distinction from previous reports, however, *China Air 2019* features a new addition: a comprehensive assessment and ranking of cities based on air quality management. This was conducted using a tool for assessing air quality management developed by CAA. After extensively evaluating air quality improvement and adopted policies, this report provides a score to rank 169 cities. An "effect score" denotes air quality improvement, while an "effort score" considers air pollution policies and measures. We can determine from this list that particular cities which score high in both effect and effort have not only achieved good air quality but may also serve as models for continuous improvement thanks to reinforceable measures. The list also includes aspirational cities with unsatisfactory air quality but considerable improvement over the past three years. We hope to see more cities ranked at these levels in the future, and that cities currently ranking poorly in both effect and effort will strive hard to elevate their performance.

To win the Blue Sky Defense Battle, Chinese cities need to make persistent efforts and take meaningful actions. CAA will continue supporting them to build a science-based, cost-effective and stakeholder-inclusive air quality management system. Together, we will endeavor to soon welcome the arrival of blue skies and healthy air into our daily lives.

Fu Lu
China Director
Clean Air Asia



Abbreviations

BRT	Bus Rapid Transit
BTH	Beijing-Tianjin-Hebei
CAA	Clean Air Asia
ECA	Emission Control Areas
ICEV	Internal Combustion Engine Vehicles
MEE	Ministry of Ecology and Environment
MEP	Ministry of Environmental Protection
MIIT	Ministry of Industry and Information Technology
NEA	National Energy Administration
NEV	New Energy Vehicle
NDRC	National Development and Reform Commission
PM	Particulate Matter
PRD	Pearl River Delta
SAMR	State Administration for Market Regulation
tce	tons of standard coal equivalent
TSP	Total Suspended Particulates
VOCs	Volatile Organic Compounds
YRD	Yangtze River Delta

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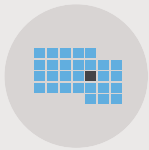
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Executive Summary



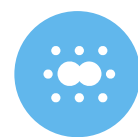
Content and Scope

As the fifth in our series "*China Air - Air Pollution Prevention and Control Progress in Chinese Cities*", this report records and analyzes air quality data from 338 cities at the prefecture level and above in 2018. It also provides a recap of China's policies, management measures and real progress in air pollution prevention and control over the past year, and comprehensively evaluates and ranks 169 key cities on air quality management.



Data and Information

In accordance with our series' principle of objectivity, this report has systematically collected air quality data and policy information to ensure its accuracy and comprehensiveness, while factually reflecting the efforts and progress of the national government, key regions and cities in air pollution control. All the data and information contained in this report has been released and shared by the government. Specific sources include: 1) Air quality data: environmental quality status reports and official news released by the Ministry of Ecology and Environment (MEE), provincial departments and municipal bureaus of ecology and environment; 2) Policy information: government documents, speeches by officials, meeting reports, and news reports by mainstream media citing official sources.



Air Quality

2018 was the first year of the Three-Year Action Plan. Chinese cities kept up the momentum of the previous five years in improving air quality, with their average annual percentage of attainment days (days that met a defined air quality target) up from 78% to 79.3%, while 193 cities saw their proportion of attainment days in the year exceed 80%, representing a year-on-year increase of 18 cities. A total of 121 cities complied with all the standards for annual mean concentration of six air pollutants, up by 22 cities from the year before. PM_{2.5} pollution was under continuous and effective control, and both annual average concentration and the percentage of non-attainment cities kept falling. However, more than half of cities exceeded the standard for PM_{2.5}. Additionally, ground-level O₃ pollution worsened, with the annual average concentration, number of non-attainment days and number of non-attainment cities all on the rise.

Air quality generally improved, but O₃ pollution continued to worsen

In 2018, the average percentage of attainment days was 79.3% across 338 cities, and a total of 121 cities complied with air quality standards, up by 22 cities from the year prior. The annual average concentrations of pollutants PM_{2.5}, PM₁₀, SO₂, NO₂ and CO all continued to fall. SO₂ standards were met in all 338 cities, while only one city exceeded the standard for CO. O₃ pollution continued to worsen with number of O₃ non-attainment cities rising (Figure 1-2). However, its annual average concentration rose at a slower rate -- from an 8% increase in 2017 down to 1.3% in 2018.

Most cities witnessed declines in their annual mean concentration of PM_{2.5}, while the number of non-attainment days rose in cities in Henan Province

For annual mean concentration of PM_{2.5}, 149 out of 169 key cities experienced a year-on-year drop that ranged from 0.8% to 32.8%, and 16 cities saw more than a 20% improvement, with Harbin showing the largest. 14 cities experienced worsening annual mean concentrations, ranging from 1.7% to 15.4%. Specifically, Jingmen and Xi'ning saw increases above 10%.

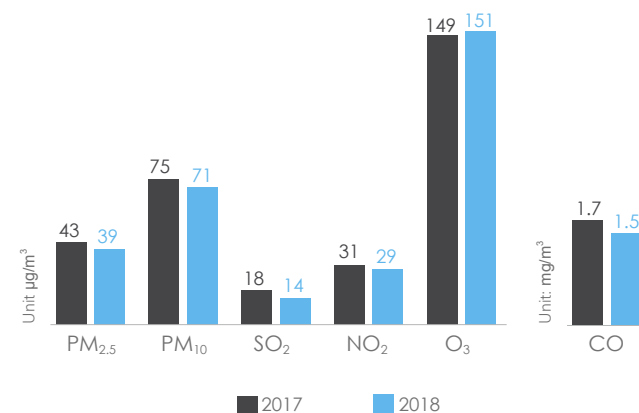


Figure 1 Annual Average Concentrations for Six Criteria Pollutants of 338 cities in 2017 and 2018

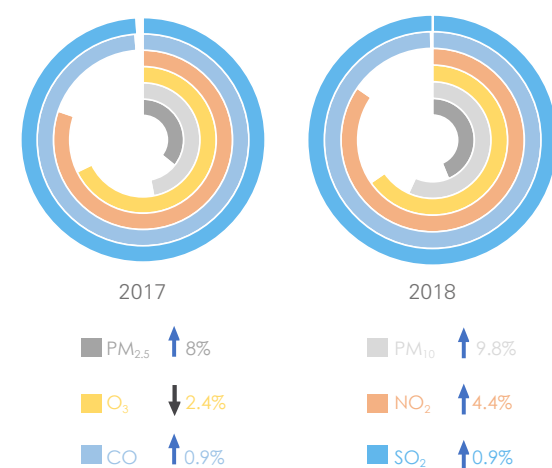


Figure 2 Percentage of Attainment Cities for Six Criteria Pollutants in 2017 and 2018

With regards to attainment days, 59 of 169 key cities witnessed declines, and 14 cities saw their total attainment days fall by more than 20 days. Cities in Henan Province demonstrated generally poor performance, with 14 of the 17 cities under its administration experiencing year-on-year declines in attainment days, 9 of which were among the top 10 cities with the steepest drops in attainment days. These drops ranged from 24 to 53 days, with Xinyang experiencing the most precipitous fall.



Policies and Measures

2018 was a milestone year in the history of air pollution prevention and control in China. On the basis of the successful implementation of the five-year Action Plan for Air Pollution and Control (the "Ten Articles"), China opened a new chapter in 2018 in the form of the Three-year Action Plan for Winning the Blue Sky Defense Battle(the "Three-year Action Plan"), launching the 2.0 Era of clean air action.

Policy implementation of air pollution prevention and control expanded, deepened and became more precise in 2018. Given the state of air quality, the severely-polluted Fen-wei Plains was added as a key region; emission reductions were realized by optimizing the structure of industry, energy, transportation and land use; precise measures were taken based on scientific research and analysis; and the concepts of "city-specific strategy" and "factory-specific strategy" were adopted for highly-polluted regions and major emission sources to realize refined treatment.

Total coal consumption continued to rebound, and clean utilization of coal moved forward

In order to control coal-combustion pollution, the elimination of coal-fired boilers with a capacity under 35t/h commenced across the country, and the Three-Year Action Plan directed that this kind of boiler shall no longer be built. Hebei Province has taken the lead in largely eliminating such boilers. Despite active coal control measures, total coal consumption went up again in 2018 after an initial rally in 2017. Total energy consumption registered 4.64 billion tons of standard coal equivalent (tce) in China, up by 3.3% from that of 2017. Among others, coal consumption was 2.737 billion tce, up by 1.0% year on year.

Regarding the clean utilization of coal, in 2018 China started retrofitting non-power industries to release ultra-low emissions, with a view to realizing the emission reduction potential of industry. Iron and steel industries and coking industries were the particular focus. Hebei Province completed 326 retrofitting projects throughout the year.

With regards to controlling the household use of raw coal, the number of pilot cities engaged in clean energy heating projects grew to 35, with the technical routes for promotion getting more inclusive. Various cities started to implement the coal replacement policy depending on the gas supply capacity and sought to avoid a "one size fits all" approach. Henan, Liaoning, Shaanxi, and Inner Mongolia were among a large number of provinces and cities to include technical routes to promote clean coal and environmentally friendly stoves within their clean energy heating policies. This has allowed regions with rich coal resources to fully make use of their resource advantage and develop clean energy heating plans suitable for local conditions and welcomed by rural residents.

Technology and data facilitated supervision of in-use vehicle emissions, but challenges still remain

Remote sensing monitoring technology for vehicle exhausts, and in-use vehicle emission databases have become important and powerful tools for monitoring in-use vehicle emissions since 2017. In 2018, the number of remote sensing monitoring equipment across the country was more than twice that of 2017, and the number of times when vehicles were under remote sensing monitoring was as high as sevenfold. Meanwhile, the national vehicle excessive emission information bank improved gradually, making it possible to trace manufacturers, importers, maintenance entities and transportation enterprises of vehicles with excessive emissions from the source.

Despite improvement in monitoring the emissions of in-use vehicles, challenges remain. Current supervision of in-use vehicle exhaust mainly focuses on indicators of smoke intensity, while the emissions of NOx and other air pollutants from gasoline and diesel vehicles on the road are yet greater challenges. Therefore, a more comprehensive means to monitor the characteristics of in-use vehicles exhaust is one aspect that should be strengthened in the supervision of in-use vehicle emissions.

Road freight volume continued to rise, and adjustments to the transportation structure still face multiple challenges

Driven by the "hard quota" set in the policy for adjusting the transportation structure, railway and water transportation saw increases in total freight volume from 2017 to 2018. However, although the share of railway transportation within the transportation structure increased in 2018, that of water transportation did not, and road transportation's share kept rising. Adjustments to the transportation structure is a continuous process.

Government promotion can shift some traffic volume to railway and water routes in the short run, but ensuring coordination between transportation structure adjustment and industrial restructuring, while also addressing the problem of the "last mile," all remain challenges to be tackled in the medium to long-term.

Beware the "one size fits all" approach when renovating "small,scattered, unregulated and high-pollution" enterprises

Previous use of strengthened supervision found that some local governments simply shut down production enterprises on a large scale in response to supervision and inspection. This left many enterprises unable to engage in normal production, did economic damage to industry, and prevented from putting in motion a true means to end polluting enterprises. To avoid such scenarios, the MEE pointedly brought in a supplementary policy before the "Looking Back" event of 2018, prohibiting any and all lockouts and production halts when supervisors entered and supervised sites.

Conclusions

Various cities classified and renovated "small, scattered, unregulated and high-pollution" enterprises in 2018, and the "one size fits all" ban made noticeable reductions. Shutdowns, upgrading, integration and relocation, and other solutions were adopted based on the "factory-specific strategy" for renovation, and an increasing number of enterprises were moved to industrial zones.

Leadership for collaborative air pollution prevention and control in the BTH Region was upgraded, and the Fen-wei Plains became a new key region

The BTH Region and its surrounding areas deepened regional collaboration on air pollution prevention and control and markedly enhanced leadership. For one, the General Office of the State Council established the Air Pollution Prevention and Control Steering Group of the BTH Region and Surrounding Areas. In addition, the MEE was established amid institutional reform, and the Department of Atmospheric Environment took up the responsibilities of the Atmospheric Environment Administration of the BTH Region and Surrounding Areas.

The years from 2015 to 2017 were three crucial years within which the Ten Articles gained ground. During this period, cities nationwide saw improved air quality on the whole, but cities in the Fen-wei Plains experienced noticeably worsening air quality over the same period, with PM pollution as severe as the BTH Region and its surrounding areas. To address the heavy pollution in this region – which is highly dependent on coal and heavy industry – the Three-year Action Plan incorporated cities within the Fen-wei Plains into a new key region, and set up a collaboration mechanism for air pollution prevention and control.



Assessment of air quality management in cities

CAA has developed a tool for assessing air quality management in cities based on an air quality management framework. It extensively evaluates air quality improvement, and the implementation of adopted policies and measures. It also ranks cities according to a comprehensive score. The assessment results reflect the overall "effort" and "effect" of the cities' policies. Specifically, improvement in air quality is reflected in an "effect score," which is largely determined by the cumulative outcome of measures adopted in recent years. Points attributed to policies and measures themselves make up the "effort score," a score which reflects the potential of continuous and long-term improvement in air quality, and which will become the basis of the "effect score" in future assessments. The results show that:

Cities in the YRD Region and Northeast China achieved noticeable air quality improvement, while cities in the Fen-wei Plains were ranked among the poorest performers

Cities in Northeast China and the YRD constituted half of the cities with excellent scores on air quality improvement. The capital cities of Northeast

China (Shenyang, Changchun, Harbin) and Dalian were ranked among the top cities following their relatively large improvement in air quality, with Changchun securing the top spot.

Among the six cities on the list with the least improvement in air quality, three were from Shanxi Province (Linfen, Jincheng and Yangquan), and three from Shaanxi Province (Xianyang, Weinan and Xi'an). All of them are "2+26" cities or cities of the Fen-wei Plains which have received close attention in recent years. While cities nationwide saw improved air quality on the whole, cities in the Fen-wei Plains demonstrated the reverse with clearly worsening air quality. Specifically, Linfen was the only city with a negative score, earning it the lowest ranking.

Beijing secured first on policies and measures, cities in Henan Province made inadequate "efforts"

Based on the "effort score" of policies and measures which reflects cities' effort level in air pollution prevention and control, first-tier cities put forth outstanding performances, with some common traits including strong fiscal capacity, research ability and a high level of planning. Their great "hard power" of technology and "soft power" of capacity allowed them to inject more resources in a bid to improve air quality. Beijing was ranked top one on the "effort score".

Cities with lower scores on policies and measures tended to be small and medium-sized cities where the policy mechanism for air quality management was incomplete, leaving considerable room for improvement. Excluding a small number of non-industrial cities with less need for stringent pollution control measures, most of these cities can be categorized as cities with poor air quality that nonetheless still made inadequate control efforts. In particular, cities in Henan Province performed badly. Among the top 20 cities with the highest annual PM_{2.5} concentration, 11 were in Henan Province.

Three cities excelled on both scores, Linfen's total score ranked last

12 cities recorded total scores that were actually higher than the maximum score after gaining bonus points. These cities were Changchun, Dalian, Shanghai, Wenzhou, Qingdao, Harbin, Huangshan, Wuhan, Hangzhou, Shenzhen, Jiaxing and Jinhua, ranked from high to low. Their scores in air quality improvement were relatively high, and 80% of these cities recorded scores of policies and measures at the level of good and above. Specifically, Shanghai, Qingdao and Hangzhou were cities with both "effort scores" and "effect scores" in the list of excellent cities, and Shenzhen and Wuhan were also very close to gaining this grade of "double excellence".

At the other end of the scale, seven cities received very poor scores: Linfen, Weinan, Xianyang, Jincheng, Yangquan, Xi'an and Yuncheng, ranked from low to high. The city of Linfen had the lowest total score. All these cities' scores in air quality improvement were very low, and all of them were among the "poorest performers" in the 2018 air quality ranking released by MEE.



Recommendations

Practice clean heating fit for local conditions in rural areas

Raw coal pollution control is an important frontline in the Three Year Action Plan, with the raw coal used for heating in rural areas being particularly crucial. As the number of rural households meeting the conditions for "coal-to-gas" and "coal-to-electricity" decreases, continuous promotion of "double replacement" will become more difficult. Regions with inadequate gas resources or network load should thoroughly consider cost-effective technical solutions based on local fiscal revenue and other local conditions.

We suggest the methodical promotion of infrastructure construction in regions with the right conditions. Specifically, step-by-step realization of coal-to-electricity in regions with the appropriate infrastructure, the realization of coal-to-gas in regions with adequate gas resources and conditions for centralized retrofitting, and the use of biomass heating in regions with rich agricultural and forestry resources. But in rural, and especially mountainous, areas with low population density and scattered distribution of households, clean-burning coal can be promoted for heating together with environmental-friendly stoves, which can address the issue at a lower cost.

Enlarge the traffic pollution monitoring network and make it more representative

The monitoring of traffic-related air pollution is critical to assessments of ambient air quality levels, analysis of pollution characteristics, and evaluations of the effects of relevant control measures. However, the ambient air quality monitoring sites in Chinese cities are distributed with more emphasis on urban air. There are few roadside monitoring stations, and few cities have air quality monitoring stations at ports. This is insufficient for covering China's massive transportation system, making it difficult to comprehensively assess the impact from traffic-related air pollution.

We suggest specifying the monitor distribution requirements and pollutants under monitoring for roadside monitoring stations in the "Technical Regulations for Selection of Ambient Air Quality Monitoring Stations." Cities should actively increase roadside monitoring sites based on local traffic-related pollution characteristics, and port cities should set up air quality monitoring stations at ports, so as to monitor the emission features of in-use vehicles in an in-depth way and assess the effectiveness of traffic-related emission control

projects in a more objective manner. This can provide a detailed and all-round scientific basis for the modelling of air quality monitoring and related policymaking.

Focus on primary problems for short-term gains, lay the foundation for long-term improvement

Cities in Northeast China performed outstandingly in their "effect scores" of air quality improvement. This is mostly because they concentrated on the main problems behind local air pollution control in recent years (coal pollution and the seasonal open burning of agricultural residue), and addressed them by vigorously promoting the retrofitting of coal-fired boilers and banning open burning.

This presents an admirable example to the cities of the Fen-wei Plains, the "underachievers" in air quality improvement. Given the coal dominated energy structure and related industry structures in the region, these cities should take active control measures immediately on total coal consumption, the rapid elimination of excessive high-emission production capacity, strict controls on the emission levels of key industries, and tougher controls on vehicle emissions in large cities, such as renovating in-use vehicles and controlling the total number of vehicles.

Urge non-attainment cities to develop and implement air quality attainment plans within a definite timeframe

The Law on Air Pollution Prevention and Control, amended in 2015, makes clear that the people's government of any cities failing to meet the national ambient air quality standard should develop an air quality attainment plan within a definite timeframe and release said plan to the public. Yet at present, only some 50 cities, or roughly one fourth of the non-attainment cities, have openly released their air quality attainment plans.

Setting an unambiguous attainment timetable and creating a roadmap for doing so are both crucial factors as the country and cities establish medium and long-term air quality improvement strategies. These factors underpin any efforts to improve air quality over time, a fact that has been verified in many developed countries and cities. Other non-attainment cities without plans should do so as soon as possible, putting forward a timetable and roadmap for air quality attainment, and establishing supporting technical methods, assessment measures and incentive mechanisms for the attainment plans.

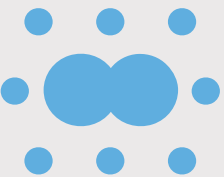
Regional collaboration on air pollution prevention and control requires a mechanism for coordinating regional interests

Currently, even in the BTH Region and its surrounding areas where an in-depth regional collaboration mechanism has already been established, mechanisms for regional collaboration on air pollution prevention and control are still being promoted and facilitated with the strong support of the central government. There is currently no mechanism for balancing regional interests, and no mechanism for considering regional emission accountability based on the degree of local air pollution, the ability to cope economically, and local environmental management levels, among other elements. This means that, even if a region has a strong scientific grounding and is able to identify an inventory of the most effective emission reduction measures, it will not be able to develop the most cost-effective holistic emission reduction strategy.

The absence of an interest coordination and compensation regime has meant some cities that do not necessarily rank low in air quality improvement lack the determination and effort to improve air quality. The only sure path to ensuring maximum shared benefits from regional collaboration is to further improve accountability and interest mechanisms. This should prompt relevant governments involved in regional collaboration on air pollution prevention and control to bear common yet differentiated responsibilities, and fully safeguard the balance of interests of every administrative region.

Chapter I.

Current Air Quality Status



2018 was the first year in which the Three-Year Action Plan was implemented. 338 cities in China kept up the momentum in air quality improvement of the previous five years, with the overall percentage of average attainment days up from 78% to 79.3%, and 193 cities, or a year-on-year increase of 18 cities, saw their share of average attainment days exceed 80%. This means targets set out in the Three-year Action Plan were achieved ahead of schedule in these cities.

A total of 121 cities reached the standards for annual mean concentration of all six air pollutants, up by 22 cities year on year. $PM_{2.5}$ pollution was under continuous and effective control, and both annual average concentration of $PM_{2.5}$ and the percentage of non-attainment cities continued to fall. Nonetheless, more than half of the cities exceeded the standard for $PM_{2.5}$. Beyond that, ozone pollution worsened, with the annual average concentration, number of non-attainment days and number of non-attainment cities on the rise.

PM_{2.5}

Compared with 2017, the range of annual mean concentration of PM_{2.5} in the 338 cities changed from 10-86µg/m³ to 9-74µg/m³, and average concentration was down from 43µg/m³ to 39µg/m³ in 2018, 11.4% higher than the National Standard (35µg/m³).

Fewer than half of the cities were attainment cities, but the percentage of attainment cities increased from 35.8% to 43.8%.

Among the key regions, the BTH Region and its surrounding areas saw the largest decline in annual average concentration from 68µg/m³ to 60µg/m³, down by 11.8%. PM_{2.5} pollution in the Fen-wei Plains, a new key region included in the Three-year Action Plan, was very close to that of the BTH Region and its surrounding areas, and its annual average concentration was down from 65µg/m³ to 58µg/m³, or a decrease of 10.8%. The two key regions are still "hotspot" regions in terms of air pollution, and there is a substantial gap between their annual average concentration and the National Standard of PM_{2.5}, that is, 35µg/m³. The annual average concentration of PM_{2.5} in the YRD region went down from 49µg/m³ to 44µg/m³, or 10.2%, showing a generally stable trend of improvement. Yet this still failed to comply with the standard. Cities in the Pearl River Delta (PRD) achieved great improvement and complied with the standard during the implementation of the Ten Articles, which is no longer a key region in the Three-Year Action Plan. Having already met attainment levels, the annual average concentration of PM_{2.5} of the PRD was further reduced from 34 µg/m³ to 32 µg/m³, down by 6.3%.

City		2013	2014	2015	2016	2017	2018
Beijing-Tianjin-Hebei	Zhangjiakou	40	35	34	32	31	29
	Chengde	50	52	43	40	35	32
	Qinhuangdao	65	60	45	46	44	38
	Langfang	110	100	85	66	60	52
	Tianjin	96	83	70	69	62	52
	Cangzhou	102	88	70	69	66	59
	Beijing	89.5	85.9	80.6	73	58	51
	Tangshan	115	101	85	74	66	60
	Handan	138	116	91	82	86	69
	Hengshui	122	108	99	87	77	62
	Xingtai	160	131	101	87	80	69
	Baoding	135	129	107	93	84	67
	Shijiazhuang	156	126	89	99	86	72
	Jinzhong					55	52
	Linfen				62	59	55
Fen-wei Plains	Yuncheng			59	74	83	70
	Lvliang					73	60
	Sanmenxia			75	66	57	57
	Luoyang				79	73	59
	Tongchuan	105	76	57	71	73	63
	Baoji			64	82		71
	Xi'an			57	59		54
	Weinan			58	59	54	49
	Xianyang			60	76	71	71

City		2013	2014	2015	2016	2017	2018
Yangtze River Delta	Zhoushan	33	30	30	25	25	22
	Lishui	49	39	38	33	33	28
	Taizhou	53	43	39	36	33	29
	Wenzhou	58	46	44	38	38	30
	Ningbo	54	46	45	39	37	33
	Quzhou	57	57	45	43	42	33
	Yancheng	65	57.5	49	43	43	43
	Jiaxing	68	57	53	44	42	37
	Shanghai	62	52	53	45	39	36
	Shaoxing	71	63	56	45	41	37
	Jinhua	70	64	54	46	42	34
	Suzhou	69	66	58	46	43	42
	Nantong	72	62	58	46	39	41
	Lianyungang	67	61.2	55	46	45	44
	Huzhou	74		57	47	42	36
	Nanjing	77	73.8	57	47.9	40	43
	Changzhou	72	67	59	49	47	50
	Hangzhou	70	64.6	57	49	45	40
	Zhenjiang	72	68	59	50	56	54
	Yangzhou	70	65.2	55	51	54	49
	Taizhou	76	68	60	51	48	47
	Wuxi	75.1	68	61	53	45	43
	Huai'an	79	68	58	53	50	45.2
	Suqian	76	67.5	61	56	55	53
	Xuzhou	76	67.3	65	60	66	62

National Standard
35 µg/m³
Min 10 Max 160

City		2013	2014	2015	2016	2017	2018
Inner Mongolia	Erdos			27	24	25	27
	Chifeng			41	37	34	31
	Hohhot	56		43	41	44	36
	Wuhai				46	44	39
	Baotou				47	46	42
	Ulanqab					29	28
	Xilingol					15	16
	Hulun Buir					20	17
	Tongliao					35	33
	Bayannur					36	35
	Hinggan League					20	21
	Alxa League					35	38
Henan	Xinyang				58	54	53
	Nanyang				63	58	60
	Sanmenxia			75	66	57	57
	Xuchang				68	59	
	Zhoukou				68	56	58
	Zhumadian				68	59	62
	Puyang				69	64	63
	Kaifeng				72	62	
	Hebi				73	65	55
	Pingdingshan				75	63	65
	Luohe				77	64	61
	Shangqiu				77	75	62
	Zhengzhou	108	88	96	78	66	63
	Luoyang				79	73	59
	Xinxiang				84	66	61
	Jiaozuo			87	85	77	67
	Anyang				86	85	74

City		2013	2014	2015	2016	2017	2018
Shanxi	Xinzhou				56	58	53
	Jincheng				62	62	60
	Jinzhong				62	59	55
	Taiyuan	81	72	62	66	66	59
	Linfen			59	74	83	70
	Datong					36	36
	Changzhi					60	54
	Yangquan					61	59
	Shuozhou					48	46
	Yuncheng					73	60
	Lvliang					55	52

City		2013	2014	2015	2016	2017	2018
Shandong	Weihai			38	35	32	25
	Yantai			45	39	35	29
	Qingdao	66	59	51	45	37	34
	Rizhao			57	55	48	42
	Tai'an			69	63	56	51
	Binzhou			77	70	64	54
	Ji'nan	108	90	87	73	63	52
	Laiwu			84	73	65	
	Zaozhuang			92	81	66	56
	Dezhou			101	81	68	58.7
	Heze			94	82	70	58
	Liaocheng			101	86	71	61
	Ji'ning			82		61	52
	Dongying			79		57	49

Figure 3 2013-2018 Annual Mean Concentration of PM_{2.5} in 338 Cities

		City	2013	2014	2015	2016	2017	2018
Shandong		Zibo					63	55
		Weifang					58	51.2
		Linyi					60	54
Fujian		Longyan				24	24	26
		Nanping				25	24	24
		Sanming				26	27	26
		Fuzhou	36		29	27	27	25
		Ningde				27	24	25
		Xiamen	36	37	29	28	27	25
		Quanzhou				28	28	27
		Putian				29	28	27
		Zhangzhou				33	35	33
Anhui		Huangshan				28	26	24
		Lu'an				46	47	45
		Maanshan			61	49	50	45
		Tongling				50.9	58.2	49
		Xuancheng				51	50	44
		Wuhu			58	53	49	49
		Anqing				54	56	46
		Huai'nan				56	62	56.3
		Hefei	88	83	66	57	56	48
		Bozhou				58	63	58.6
		Chuzhou				59	56	50
		Bengbu					60	54.7
		Huaibei					64	57
		Fuyang					68	55
		Suzhou					70	58.3
		Chizhou				44	60	44

		City	2013	2014	2015	2016	2017	2018
Jiangxi		Yingtan				41	41	36
		Fuzhou				41	47	36.6
		Shangrao				41	44	36
		Nanchang	69	52	43	44	41	30
		Ganzhou				45	47	39
		Jiujiang				50	48	43
		Jingdezhen					40	31.25
		Pingxiang					51	43
		Xinyu				43	48	39.2
		Ji'an					53	40.2
		Yichun					51	40

South China

		City	2013	2014	2015	2016	2017	2018
Hubei		Xiaogan			72	45	49	42
		Xianning			55	48	47	37
		Enshi			54	48	36	38
		Huanggang			59	51	49	42
		Shiyan			56	51	41	43
		Suizhou			66	56	51	45
		Wuhan	94	82	70	57	53	49
		Huangshi			68	57	55	43
		Jingmen		88	71	58	50	57
		Jingzhou			70	60	56	49
		Ezhou			68	60	56	46
		Yichang		93	70	62	58	53
		Xiangyang			76	64	66	61

		City	2013	2014	2015	2016	2017	2018
Hunan		Chenzhou				41	38	31
		Huaihua				42	39	31
		Yiyang				44	41	35
		Xiangxi Prefecture				44	40	35
		Yongzhou				45	45	48
		Loudi				46	41	34
		Zhangjiajie			53	48	42	32
		Yueyang				49	49	45
		Zhuzhou			55	51	52	45
		Xiangtan			56	51	51	49
		Hengyang				52	49	43
		Changsha	83	74	61	53	52	48
Guangxi		Shaoyang				54	55	47
		Changd			52	56	54	44
		Fangchenggang				29	30	30
		Hechi				34	35	31
		Nanning	57	49	41	36	35	34
		Qinzhou				37	35	32
		Guigang				38	42	40
		Liuzhou			50	44	45	41
		Guilin			51	47	44	38
		Beihai					28	27
		Wuzhou					41	37
		Yulin					40	39
		Baise					42	37
		Hezhou					42	37.95
		Laibin					48	40
		Chongzuo					32	31

		City	2013	2014	2015	2016	2017	2018
Guangdong		Shanwei			28	24	27	
		Zhanjiang			28	26	29	27
		Meizhou			35	28	30	30
		Shantou			33	30	29	27
		Heyuan			34	32	29	
		Chaozhou			38	33.4	30	
		Qingyuan			33	36	32	31
		Jieyang			39	39	34	
		Shaoguan			34	33	38	
		Maoming			32	30	32	
		Yangjiang			32	31	33	
		Yunfu			34	34	37	33
		Zhuhai	38		31	26	30	27
		Shenzhen	39.6	34	30	27	28	26
		Huizhou	38		27	27	29	28
		Zhongshan	49	38	33	30	33	30
		Jiangmen	50	44	34	34	37	31
Hainan		Dongguan	48	45	36	35	37	36
		Guangzhou	53	49	39	36	35	35
		Zhaoqing	54.7	52	39	37	37	33
		Foshan	53	45	39	38	40	35
		Sanya			17	14	15	
		Haikou			22	21	20	18

City		2013	2014	2015	2016	2017	2018
Sichuan	Guangyuan				27.9	23.1	27.1
	Panzhihua			32	32	34	36
	Ya'an				42	49	40.8
	Suining				44	38	36
	Guang'an				46	37	40.3
	Mianyang			47	49	47.8	45
	Ziyang				49	36	35.7
	Neijiang				54	48	38
	Deyang			53	55	54	49
	Dazhou				56	50	47.1
	Chengdu	97	77	64	63	56	51
	Leshan				63.3	55.3	47
	Luzhou			61	64	52.6	39
	Zigong			73	73	66	54.1
	Yibin			58		56	51.9
	Nanchong					46	47.9
	Meishan					49.2	35.4
	Bazhong					32.7	30.3
	Aba Prefecture					17	15
	Ganzi Prefecture					19	19.8
	Liangshan Prefecture					22	23.7
Tibet	Lhasa	26		26	28	20	17
	Changdu Prefecture						
	Shannan Prefecture						
	Shigatse Prefecture						
	Naqu Prefecture						
	Ali Prefecture						
	Linshi Prefecture						

City		2013	2014	2015	2016	2017	2018
	Chongqing	70	65	57	54	45	40
Yunnan	Chuxiong Prefecture				22	22	24
	Kunming	42		30	28	29	28
	Lincang				28	24	
	Qujing					28	30
	Yuxi					23	
	Zhaotong					31	
	Lijiang					14	
	Honghe Prefecture					34	
	Diqing Prefecture					10	
	Baoshan					25	21
	Puer					28	
	Wenshan Prefecture					23	
	Xishuangbanna					26	26
	Dali Prefecture					23	17
	Dehong Prefecture					30	
	Nujiang Prefecture					20	
Guizhou	Tongren				25	24	26
	Anshun				27	30	32
	Qiandongnan Prefecture				28	32	
	Bijie				30	30	31
	Guiyang	53	48	39	37	32	32
	Liupanshui				39	40	35
	Zunyi			42	44	33	28
	Qianxi'nan Prefecture						
	Qiannan Prefecture						

City		2013	2014	2015	2016	2017	2018
Gansu	Jinchang				32	29	22
	Jiayuguan				33	23	23
	Dingxi				36	36	40
	Zhangye				38	29	32
	Gannan				38		32
	Baiyin				39	33	34
	Wuwei				39	38	36
	Pingliang				41	30	37
	Tianshui				42		40
	Lanzhou	67.1		52	54	49	47
	Jiuquan					28	32
	Qingyang						
	Longnan					31	34
	Linxia Prefecture						46
Qinghai	Yushu Prefecture				17	19	18
	Haixi Prefecture				27	24	20
	Hainan Prefecture				31	27	20
	Haibei Prefecture				32	28	25
	Guoluo Prefecture				37	27	24
	Huangnan Prefecture				45	33	30
	Haidong Prefecture				46	47	45
	Xi'ning	70	63	49	49	39	45
Ningxia	Shizuishan				47		39
	Wuzhong				48		31
	Yinchuan	51		51	56	49	38
	Guyuan						34
	Zhongwei					34	33

City		2013	2014	2015	2016	2017	2018
Xinjiang	Karamay			31	30		28
	Urumqi	87	61	66	74	70	
	Korla						50
	Turpan						
	Changli Prefecture					48	
	Ili Prefecture					51	
	Hami Prefecture					31	
	Bortala Prefecture						
	Aksu Prefecture						
	Kizilsu Prefecture						
	Kashi Prefecture						
	Hetian Prefecture						
	Tacheng Prefecture						
	Altay Prefecture						
	Wujiaqu						
	Shihezi						60
Shaanxi	Shangluo				39	36	
	Tongchuan			58	59	54	49
	Baoji			57	59		54
	Xi'an	105	76	57	71	73	63
	Weinan			60	76	71	71
	Xianyang			64	82		71
	Yan'an						
	Hanzhong					53	49
	Yulin					34	35
	Ankang						

City		2013	2014	2015	2016	2017	2018
Heilongjiang	Jixi			29	28	43	34
	Shuangyashan			43	34	40	28
	Qiqihar			38	36	38	28
	Mudanjiang		59	48	37	36	30
	Harbin	81	72	70	52	58	39
	Daqing			45	38	35	28
	Hegang			48	38	35	27
	Yichun			30	19	23	21
	Jiamusi			31	33	38	29
	Qitaihe			56	47	47	32
	Heihe			29	23	23	19
	Suihua			36	33	36	35
	Great Khingan			24	22	19	19
Jilin	Yanbian				31	31	27
	Songyuan				35	35	27
	Jilin			59	42	52	37
	Tonghua				42	35	28
	Changchun	73	68	66	46	46	33
	Siping				46	46	38
	Liaoyuan				46	44	34
	Baicheng				48	31	28
	Baishan				50	44	32

City		2013	2014	2015	2016	2017	2018
Liaoning	Dalian	52	53	48	39	34	30
	Zhaoyang				39	42	39
	Panjin				40	39	36
	Dandong			46	42	35	29
	Fushun			53	44	47	43
	Yingkou			49	44	43	40
	Benxi			56	45	40	34
	Huludao			54	47	47	42.8
	Liaoyang				47	47	39
	Tieling				48	50	40
	Shenyang	78	74	72	54	51	41
	Jinzhou			60	55	48	46
	Anshan			72		48	41
	Fuxin					41	37

PM₁₀

Compared with 2017, the range of annual mean concentrations of PM₁₀ across all 338 cities changed from 23-154µg/m³ to 18-190µg/m³, and average concentration was down from 75µg/m³ to 71µg/m³ in 2018, 1µg/m³ higher than the National Standard of 70µg/m³.

The percentage of attainment cities rose from 47.0% to 56.8%, exceeding more than half of the total cities for the first time.

Among the key regions, the BTH Region and its surrounding areas saw a decline from 120µg/m³ to 109µg/m³, down by 9.2%; Fen-wei Plains experienced a reduction from 114µg/m³ to 106µg/m³, down by 7.0%. Yet the PM pollution levels of the two regions was still high. The YRD saw its figures drop from 78µg/m³ to 70µg/m³, a decrease of 10.3%, reaching the National Standard for the first time. Having already achieved attainment status, the PRD reduced further from 53µg/m³ to 50µg/m³, or 5.7%.

City		2013	2014	2015	2016	2017	2018
Beijing-Tianjin-Hebei	Chengde	104	111	92	81	82	78
	Qinhuangdao	124	114	99	87		77
	Beijing	108.1	115.8	101.5	92	84	78
	Tianjin	150	133	116	103	94	82
	Langfang	184	159	137	112	102	97
	Tangshan	184	163	141	127	119	110
	Hengshui	217	192	174	143	137	101
	Baoding	220	224	174	147	135	114
	Shijiazhuang	309	216	147	164	154	131
	Handan	238	187	166		155	133
	Cangzhou	130	138	121		105	102
	Xingtai	294	235	172	144	148	131
	Zhangjiakou	91	78	78		70	69
Fen-wei Plains	Lvliang					112	95
	Jinzhong				109	112	110
	Linfen			89			117
	Yuncheng					125	108
	Sanmenxia			134	127	98	99
	Luoyang				130	123	104
	Xi'an	190	147	125	137	130	122
	Xianyang				149		134
	Baoji			108	111		105
	Tongchuan			104	104	97	89
	Weinan			110	139	135	134

City		2013	2014	2015	2016	2017	2018
Yangtze River Delta	Shanghai	82	71	69	59	55	51
	Ningbo	86	73	69	62	60	
	Shaoxing	98		79	68	63	59
	Nantong	108	96	88	70	65	63
	Suzhou	95	86	80	72	66	65
	Zhenjiang	124	107	82	80	90	76
	Changzhou	102	104		81	73	73
	Wuxi	112.1	105	94	82	79	75
	Nanjing	137	123	96	85.2	76	75
	Yangzhou			101	87	95	90
	Taizhou	110	107	101	87	79	74
	Lianyungang	119	111	94	87	75	
	Huai'an	114	105	96	92	89	69.5
	Xuzhou	123	119	122	118	119	104
	Taizhou	75	71	66		59	
	Huzhou	109		76		64	
	Yancheng	103	92	85		79	81
	Hangzhou		98	85		72	68
	Jiaxing		81			67	
	Lishui	65	62			50	46
	Wenzhou	95	75			65	58
	Suqian	126	113			78	76
	Jinhua	99				58	55
	Zhoushan					45	
	Quzhou					64	54



City		2013	2014	2015	2016	2017	2018
Inner Mongolia	Erdos			69	63	72	90
	Chifeng			88	76	73	76
	Baotou				105	99	103
	Wuhai				111	113	99
	Hohhot	145		103		99	86
	Ulanqab					53	63
	Xilingol					46	68
	Hulun Buir					42	31
	Tongliao					69	65
	Bayannur					96	99
	Hinggan League					45	39
	Alxa League					76	94
Henan	Xinyang				96	90	86
	Zhoukou				113	98	103
	Nanyang				119	109	96
	Zhumadian				120	106	111
	Kaifeng				122	103	
	Xuchang				122	96	
	Pingdingshan				125	106	101
	Sanmenxia			134	127	98	99
	Shangqiu				127	131	103
	Hebi				128	120	108
	Luoyang				130	123	104
	Luohe				130	116	103
	Puyang				137	107	102
	Jiaozuo			150	142	134	116
	Zhengzhou	171	158		143	118	106
	Xinxiang				144	116	105
	Anyang				155	132	123

City		2013	2014	2015	2016	2017	2018
Shanxi	Xinzhou				103	112	96
	Jinzhong				109	112	110
	Jincheng				111	117	118
	Taiyuan	157	138	114	125	131	135
	Linfen			89			117
	Datong					73	82
	Changzhi					103	98
	Yangquan					116	108
	Shuozhou					99	112
	Yuncheng					125	108
	Lvliang					112	95

City		2013	2014	2015	2016	2017	2018
Shandong	Weihai			65	63	62	50
	Yantai			77	76	69	66
	Qingdao	107	107	94	85	76	72
	Rizhao			102	101	87	79
	Tai'an			126	112	103	102
	Binzhou			126	123	110	98
	Laiwu			133	127	117	
	Ji'nan	191	172	157	141	130	112
	Zaozhuang			159	141	126	115
	Dezhou				141	122	113.6
	Heze			155	143	131	119
	Liaocheng			164	151	136	123
	Ji'ning			140		103	99
	Dongying			136		110	94

Figure 4 2013-2018 Annual Mean Concentration of PM₁₀ in 338 Cities

		City	2013	2014	2015	2016	2017	2018
Shandong		Zibo					63	55
		Weifang					58	51.2
		Linyi					60	54
Fujian		Nanping				24	24	26
		Putian				25	24	24
		Longyan				26	27	26
		Sanming	36		29	27	27	25
		Ningde				27	24	25
		Xiamen	36	37	29	28	27	25
		Quanzhou				28	28	27
		Fuzhou				29	28	27
		Zhangzhou				33	35	33
Anhui		Huangshan				45	51	42
		Chizhou				66	89	67
		Xuancheng				68	76	64
		Anqing				71	80	65
		Lu'an				73	80	78
		Wuhu			81	75	82	67
		Maanshan			87	75	83	75
		Chuzhou				77	83	80
		Tongling				77.8	88.4	75
		Hefei	115	113	91.9	83	80	73
		Bozhou				83	103	98.3
		Huai'nan				85	107	88.9
		Huaipei				87	100	90
		Bengbu					98	87.3
		Fuyang					108	90
		Suzhou					97	90.1

		City	2013	2014	2015	2016	2017	2018
Jiangxi		Yingtan				59	59	52
		Fuzhou				63	64	59
		Ganzhou				68	72	63
		Shangrao				70	75	63
		Jiujiang				74	70	68
		Nanchang	116	85	75	78	76	64
		Jingdezhen					67	56
		Pingxiang					84	71
		Xinyu				76	82	70.5
		Ji'an					75	66.7
		Yichun					76	65.8

South China

		City	2013	2014	2015	2016	2017	2018
Hubei		Enshi Prefecture		79	76	69	54	60
		Huanggang		102	85	75	84	74
		Xianning		94	90	77	62	56
		Xiaogan		103	110	78	80	72
		Shiyan			98	90	81	64
		Suizhou			108	103	88	75
		Huangshi			103	102	89	86
		Wuhan	124	113	104	92	88	73
		Xiangyang			113	108	93	90
		Yichang			136	107	97	88
		Jingmen			110	114	99	84
		Jingzhou			150	109	100	92
		Ezhou			110	104	100	85
								73

		City	2013	2014	2015	2016	2017	2018
Hunan		Chenzhou				70	70	61
		Yongzhou				70	67	69
		Loudi				71	66	66
		Yueyang				72	71	72
		Zhangjiajie			78	72	67	58
		Changsha		84	76	73	70	61
		Hengyang				76	70	66
		Shaoyang				77	78	65
		Xiangxi Prefecture				78	75	59
		Huaihua				79	83	50
		Changde			82	80	77	62
		Yiyang				82	78	69
Guangxi		Zhuzhou			86	83	82	71
		Xiangtan				85	81	68
		Fangchenggang				45	46	47
		Guigang				55	66	63
		Hechi				55	60	59
		Nanning	90	84	72	62	56	57
		Guilin			70	64	60	55
		Liuzhou			70	66	66	62
		Beihai			48		45	46
		Wuzhou					60	61
		Qinzhou					55	53
		Yulin					59	
		Baise					63	60
		Hezhou					66	57
		Laibin					70	65
		Chongzuo					47	52

		City	2013	2014	2015	2016	2017	2018
Guangdong		Shanwei			41	38	43	
		Zhanjiang			45	39	42	39
		Yangjiang			48	44	48	
		Meizhou			51	46	50	49
		Heyuan			49	46	48	
		Maoming			48	47	50	
		Shantou			52	48	49	44
		Shaoguan			50	51	52	
		Yunfu			54	51	57	53
		Chaozhou			58	51.2	50	
		Qingyuan			51	52	47	46
		Jieyang			56	60	55	
		Zhuhai	59		51	41	43	43
		Shenzhen	62	53	49	42	45	44
		Zhongshan	66	57	49	44	49	45
		Huizhou			50	45	51	47
Hainan		Dongguan	65	60	51	49	51	50
		Foshan	83	66	58	55	63	60
		Jiangmen	76	64	50	55	60	56
		Zhaoqing		74	56	55	56	51
		Guangzhou	72	67	59	56	56	54
		Sanya			32	28	28	
		Haikou			40	39	37	35

City		2013	2014	2015	2016	2017	2018
Sichuan	Panzhihua			64	65	66	64
	Suining				68	63	61
	Ya'an				68	67	55.8
	Guangyuan				69.6	59.2	56.5
	Neijiang				76	70	58
	Mianyang			72	78	71.4	72
	Guang'an				78	74	70.3
	Dazhou				86	77	74.6
	Luzhou			89	86.8	80	59
	Deyang			75	91	87	78
	Leshan				92.9	83.7	70.1
	Ziyang				95	82	69.5
	Zigong			103	99	89	77.8
	Chengdu	150	123	108	105	88	81
	Yibin			82		80	75
	Nanchong					72	72.9
	Meishan					80.1	60.6
	Bazhong					53.6	51.4
	Aba Prefecture					34	26.6
	Ganzi Prefecture					31	31.5
	Liangshan Prefecture					45	37.6
Tibet	Lhasa			59	80	54	
	Changdu Prefecture					51	
	Shannan Prefecture					30	
	Shigatse Prefecture					41	
	Naqu Prefecture					86	
	Ali Prefecture					28	
	Linshi Prefecture					30	

City		2013	2014	2015	2016	2017	2018
Yunnan	Chongqing	106	98	87	77	72	64
	Chuxiong Prefecture				35	40	40
	Lincang				43.5	40	
	Kunming	82		56	55	58	51
	Qujing					54	53
	Yuxi						
	Zhaotong					56	
	Lijiang					27	
	Honghe Prefecture					51	
	Diqing Prefecture					36	
	Baoshan					39	40
	Puer					44	
	Wenshan Prefecture					39.7	
	Xishuangbanna					48	
	Dali Prefecture					33	38
	Dehong Prefecture					46	
	Nujiang Prefecture					43	
Guizhou	Anshun				38	44	47
	Bijie				44	47	52
	Qiandongnan Prefecture				45	46	
	Tongren				50	66	57
	Guiyang	86	73	61	63	53	57
	Liupanshui				68	66	57
	Zunyi			71	69	54	47
	Qianxi'nan Prefecture						
	Qiannan Prefecture						

City		2013	2014	2015	2016	2017	2018
Gansu	Gannan				70		63
	Dingxi				75	69	81
	Tianshui				80		79
	Pingliang				80	73	75
	Zhangye				90	81	66
	Baiyin				95	85	82
	Wuwei				97	81	80
	Jiayuguan			98	98	97	79
	Jinchang				104	101	76
	Lanzhou	153	126	120	132	111	103
	Jiuquan					89	90.7
	Qingyang						
	Longnan					62	58
	Linxia Prefecture						81
Qinghai	Yushu Prefecture				40	46	49
	Haixi Prefecture				65	62	45
	Hainan Prefecture				69	57	51
	Guoluo Prefecture				72	56	47
	Haibei Prefecture				76	55	49
	Huangnan Prefecture				86	56	60
	Xi'ning	163	120	106	113	99	89
	Haidong Prefecture				114	104	85
Ningxia	Wuzhong				98		75
	Shizuishan				114		89
	Yinchuan	119		112	111	117	87
	Guyuan						82
	Zhongwei					81	75

City		2013	2014	2015	2016	2017	2018
Xinjiang	Karamay			64	55		60
	Urumqi	146	146	133	115	106	
	Korla						177
	Turpan						
	Changli Prefecture					77	
	Ili Prefecture					83	
	Hami Prefecture					78	
	Bortala Prefecture						
	Aksu Prefecture						
	Kizilsu Prefecture						
	Kashi Prefecture						
	Hetian Prefecture						
	Tacheng Prefecture						
	Altay Prefecture						
Shaanxi	Wujiaqu						
	Shihezi						
	Shangluo				72	65	
	Tongchuan			104	104	97	89
	Baoji			108	111		105
	Xi'an	190	147	125	137	130	122
	Weinan			110	139	135	134
	Xianyang				149		134
	Yan'an						
	Hanzhong					86	81
	Yulin						78
	Ankang						

City		2013	2014	2015	2016	2017	2018
Heilongjiang	Jixi			61	53	75	57
	Shuangyashan			69	55	61	49
	Qiqihar			63	61	65	53
	Mudanjiang		91	78	68	65	58
	Harbin	119	111	103	74	87	65
	Daqing			62	59	59	46
	Hegang			78	67	65	61
	Yichun			51	33	36	38
	Jiamusi			53	48	57	47
	Qitaihe			85	74	84	80
	Heihe			50	37	41	40
	Suihua			60	58	65	53
	Great Khingan			55	43	33	34
Jilin	Yanbian				49	46	45
	Liaoyuan				63	59	48
	Jilin			98	69	79	63
	Songyuan				69	71	61
	Baicheng				75	55	50
	Tonghua				76	62	54
	Siping				77	80	68
	Changchun	129	118	107	78	78	61
	Baishan				81	71	59

City		2013	2014	2015	2016	2017	2018
Liaoning	Dalian	66	74	81	67	59	56
	Panjin				67	66	59
	Zhaoyang				69	76	76
	Dandong			76	71	61	50
	Yingkou			77	73	69	69
	Benxi			89	74	71	65
	Fushun			93	78	81	73
	Jinzhou			92	81	78	78
	Fuxin				83	81	69
	Liaoyang				83	82	69
	Tieling				83	85	74
	Huludao			99	87	80	74.25
	Shenyang	129	124	115	94	88	75
	Anshan			115		95	77

SO₂

The annual mean concentration of SO₂ continued to fall below the attainment level. Compared with 2017, the range of annual mean concentrations of SO₂ across all 338 cities changed from 2-84µg/m³ to 3-46µg/m³, and average concentration was down from 18µg/m³ to 14µg/m³ in 2018, meeting the National Standard of 60µg/m³.

The percentage of attainment cities grew from 99.1% to 100%, making SO₂ the first pollutant for which the annual concentration of all cities complied with the standard.

All the key regions reached the standard. Specifically, the annual average concentration in the Fen-wei Plains was the highest, but it also saw the largest decline, from 38µg/m³ to 24µg/m³, a decrease of 36.8%. The BHT Region and its surrounding areas saw its figure drop from 29µg/m³ to 20µg/m³, down by 31%. The YRD saw its figure drop from 15µg/m³ to 11µg/m³, down by 26.7%. In addition, the PRD saw its numbers fall from 11µg/m³ to 9µg/m³, down by 18.2%.

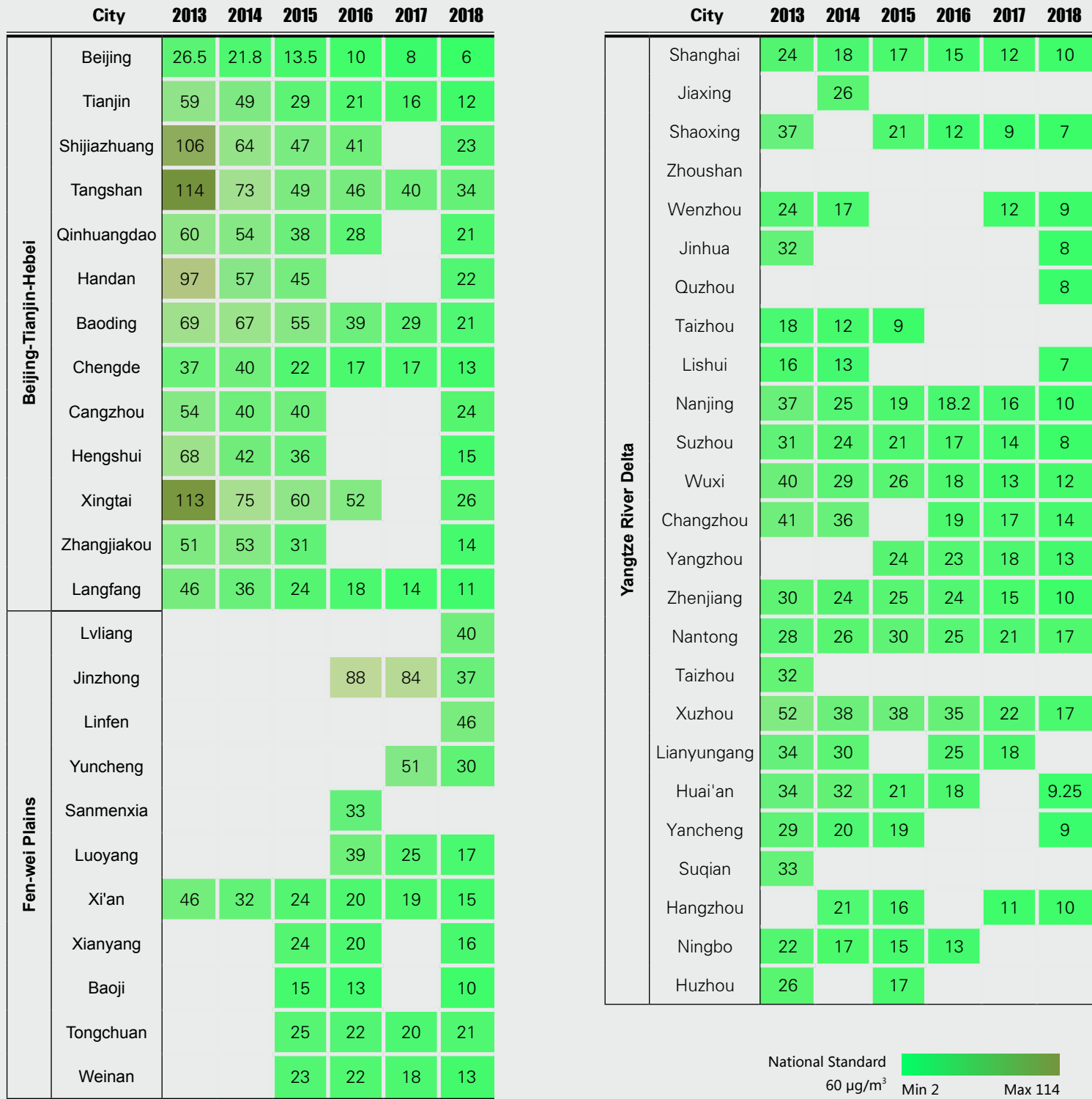
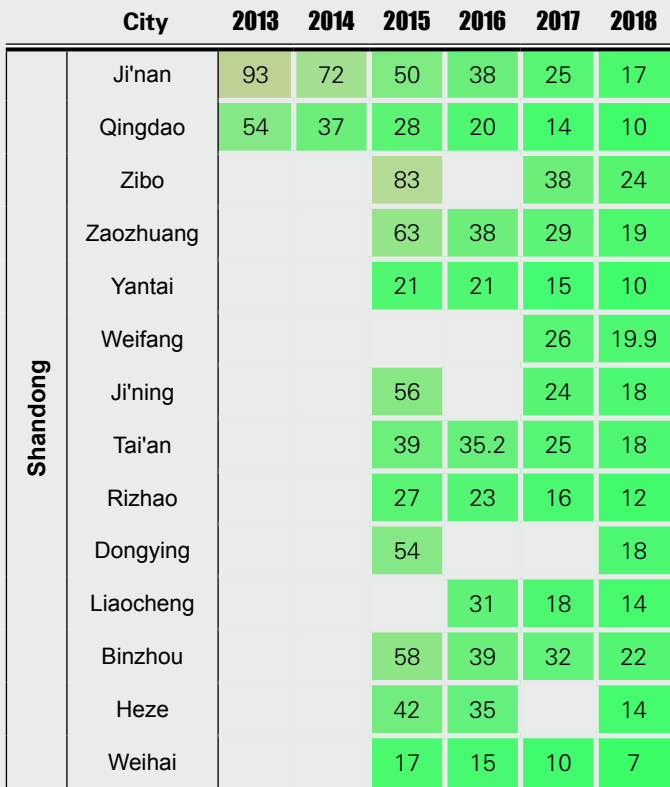


Figure 5 2013-2018 Annual Mean Concentration of SO₂ in 338 Cities



	City	2013	2014	2015	2016	2017	2018
Shandong	Laiwu						
	Linyi					23	18
	Dezhou				34		25.5
Fujian	Fuzhou	10			6		7
	Xiamen	20	16	10	11		9
	Quanzhou				11		10
	Putian				7		9
	Sanming				15		13
	Zhangzhou				15		8
	Nanping				11		9
	Longyan				10		10
	Ningde				6	9	8
Anhui	Hefei		16	15	12	7	
	Wuhu		20	21	15	11.5	
	Maanshan		24	20		15.3	
	Bengbu					16.1	
	Huai'nan				19	18	15.4
	Huaibei					21	17
	Tongling				43	27	18
	Anqing				19	15	11
	Huangshan				15		10
	Chuzhou				18	13	11
	Fuyang					13	9
	Suzhou						16.2
	Lu'an				13	11	7
	Bozhou				27		12.7
	Chizhou				20	15	12
	Xuancheng				21	21	11

	City	2013	2014	2015	2016	2017	2018
Jiangxi	Nanchang	40		19	17	15	11
	Jiujiang				21	20	13
	Jingdezhen						12.7
	Pingxiang						19
	Xinyu						20.75
	Yingtian				32	30	21
	Ganzhou				26		18
	Ji'an						20.2
	Yichun						18.25
	Fuzhou						13.8
	Shangrao						22.6

South China

	City	2013	2014	2015	2016	2017	2018
Hubei	Wuhan	33	21	18	11	10	9
	Yichang			20	14	12	11
	Jingzhou			26	23	18	15
	Huangshi				19	18	14
	Ezhou				23	15	11
	Xiaogan				11	11	9
	Huanggang				9	11	9
	Xianning				8	7	5
	Shiyan				17	14	15
	Xiangyang				15	16	14
	Jingmen				21	18	15
	Suizhou				10	9	7
	Enshi Prefecture				10	9	7

	City	2013	2014	2015	2016	2017	2018
Hunan	Changsha		24	18	16	13	10
	Yueyang				21	14	10
	Changde			25	19	12	11
	Zhangjiajie			10	7	8	7
	Zhuzhou			25	25	19	18
	Xiangtan				25	20	16
	Hengyang				16	16	16
	Shaoyang				31	29	18
	Yiyang				27	13	9
	Chenzhou				16	15	15
	Yongzhou				19	12	11
	Huaihua				19	11	10
	Loudi				22	17	11
	Xiangxi Prefecture				10	4	4
Guangxi	Nanning	19	15	13	12	11	11
	Guilin			21	17	15	12
	Beihai						
	Liuzhou			24	21	19	15
	Wuzhou					12	
	Fangchenggang				9		11
	Qinzhou						
	Guigang						
	Yulin						
	Baise						
	Hezhou						
	Hechi				12	9	
	Laibin						
	Chongzuo						

	City	2013	2014	2015	2016	2017	2018
Guangdong	Shaoguan			19			
	Shantou			13	14	12	12
	Zhanjiang			10	10		9
	Maoming			14			
	Meizhou			9	7	8	7
	Shanwei			10			
	Heyuan			10	7		
	Yangjiang						
	Qingyuan				14	11	10
	Chaozhou						
	Jieyang			17	15	15	
	Yunfu						15
	Guangzhou	20	17	13	12	12	10
	Shenzhen	11	9	8	8	8	7
	Zhuhai	13		9	9		7
Hainan	Foshan	32	25	17	14	13	11
	Jiangmen	27	24	16	12	12	9
	Dongguan	23	19		11	12	10
	Zhongshan	19	16		11	10	9
	Huizhou						
	Zhaoqing		25	20	16	13	11
	Haikou			6	6	6	5
	Sanya			3		2	

City		2013	2014	2015	2016	2017	2018
Sichuan	Chengdu	31	19	14	14	11	9
	Mianyang			13	11	9	6.4
	Yibin			24		18	16
	Panzhihua			34	38	35	40
	Luzhou			22	18	17	15
	Zigong			17	15	15	13.3
	Deyang			22	15	14	12
	Nanchong						9.4
	Suining				13		10
	Neijiang				18		10
	Leshan			19.4	16.2	7.7	
	Meishan						9.8
	Guang'an				18	13	9
	Dazhou				12	11	10.2
	Ziyang				17	10	8.1
	Guangyuan				18.9	21.1	19.7
	Ya'an				15	11	14.5
	Bazhong					42	4.2
	Aba Prefecture					11	7.8
	Ganzi Prefecture						10.4
	Liangshan Prefecture					12	16.4
Tibet	Lhasa		10	8			
	Changdu Prefecture						
	Shannan Prefecture						
	Shigatse Prefecture						
	Naqu Prefecture						
	Ali Prefecture						
	Linshi Prefecture						
	Linzhi Prefecture						

City		2013	2014	2015	2016	2017	2018
	Chongqing	32	24	16	13	12	9
Yunnan	Kunming	28		17	17	15	13
	Qujing						14
	Yuxi						
	Zhaotong						
	Lijiang						
	Chuxiong Prefecture				22	19	15
	Honghe Prefecture						
	Diqing Prefecture						
	Baoshan						7
	Puer						
	Lincang				11.5	12	
	Wenshan Prefecture					9.7	
	Xishuangbanna						
	Dali Prefecture						5
	Dehong Prefecture						
	Nujiang Prefecture						
Guizhou	Guiyang	31	24	17	13	13	11
	Zunyi			16	11	12	12
	Liupanshui				17	18	17
	Bijie				17	13	11
	Anshun				22	20	17
	Tongren				12	10	4
	Qianxi'nan Prefecture						
	Qiandongnan Prefecture				13	8	
	Qiannan Prefecture						

City		2013	2014	2015	2016	2017	2018
Gansu	Lanzhou	33	29		19	20	21
	Jiayuguan			25	21	17	14
	Jinchang				37	27	21
	Baiyin				42		46
	Tianshui				27		17
	Wuwei				23	14	8
	Zhangye				25	13	10
	Pingliang				19		11
	Jiuquan					14	9.4
	Qingyang						
	Dingxi				25	22	17
	Longnan					20	17
	Linxia Prefecture						23
	Gannan				19		14
Qinghai	Xi'ning	48	41	31	31	24	20
	Haidong Prefecture				22	20	18
	Haibei Prefecture				19	14	16
	Huangnan Prefecture				17	15	17
	Hainan Prefecture				13	18	9
	Guoluo Prefecture				25	27	23
	Yushu Prefecture				13	20	15
	Haixi Prefecture				21	20	17
Ningxia	Yinchuan	77		64		48	27
	Shizuishan						17
	Wuzhong				41		17
	Guyuan						27
	Zhongwei					24	41

City		2013	2014	2015	2016	2017	2018
Xinjiang	Urumqi	29	25	15	14	13	
	Karamay						
	Korla						7
	Turpan						
	Changli Prefecture					15	
	Ili Prefecture					23	
	Hami Prefecture						
	Bortala Prefecture						
	Aksu Prefecture						
	Kizilsu Prefecture						
	Kashi Prefecture						
	Hetian Prefecture					35	
	Tacheng Prefecture						
	Altay Prefecture						
	Wujiaqu						
	Shihezi						
Shaanxi	Xi'an	46	32	24	20	19	15
	Xianyang			24	20		16
	Tongchuan			25	22	20	21
	Yan'an						
	Baoji			15	13		10
	Weinan			23	22	18	13
	Hanzhong					15	11
	Yulin						
	Ankang						
	Shangluo				20		

City		2013	2014	2015	2016	2017	2018
Heilongjiang	Harbin	44	57	40	28		20
	Qiqihar			26	23	22	15
	Daqing			18		13	13
	Mudanjiang		25	20	18	10	
	Jixi				20		
	Hegang						
	Shuangyashan				18	13	9
	Yichun						
	Jiamusi						
	Qitaihe						
	Heihe					16	
	Suihua						
	Great Khingan						
	Changchun	44	41	36	28	26	16
Jilin	Jilin			30	23	18	15
	Siping				22	26	14
	Liaoyuan				25	18	13
	Tonghua				29	26	16
	Baishan				35	29	21
	Songyuan				15	14	7
	Baicheng				12	11	10
	Yanbian				14	15	11

City		2013	2014	2015	2016	2017	2018
Liaoning	Shenyang	90	82	66	47	37	26
	Dalian	31	29		26	17	12
	Anshan			49			22
	Fushun			31	27		
	Benxi			43	36	27	21
	Jinzhou			59	52	45	39
	Dandong						
	Yingkou			29	23		12
	Panjin						
	Huludao			47			38.3
	Fuxin				39		
	Liaoyang				27		
	Tieling				30	20	
	Zhaoyang				34		

NO₂

Among the six pollutant indexes, the annual average concentration of NO₂ was down the least. Compared with 2017, the range of annual average concentration of NO₂ in all 338 cities changed from 9-59μg/m³ to 7-56μg/m³. Although annual mean concentration was lower than the National Standard (40 μg/m³) on average, the degree of decline was small, down from 31 μg/m³ to 29 μg/m³.

The percentage of attainment cities rose from 80.2% to 84.6% of all cities.

Among the key regions, annual average concentrations in the BTH Region and its surrounding areas and the Fen-wei Plains were higher than the National Standards, both standing at 43 μg/m³, down by 8.5% and 4.4% year on year respectively. Those in the YRD and the PRD dropped to 35 μg/m³, both down by 5.4%.

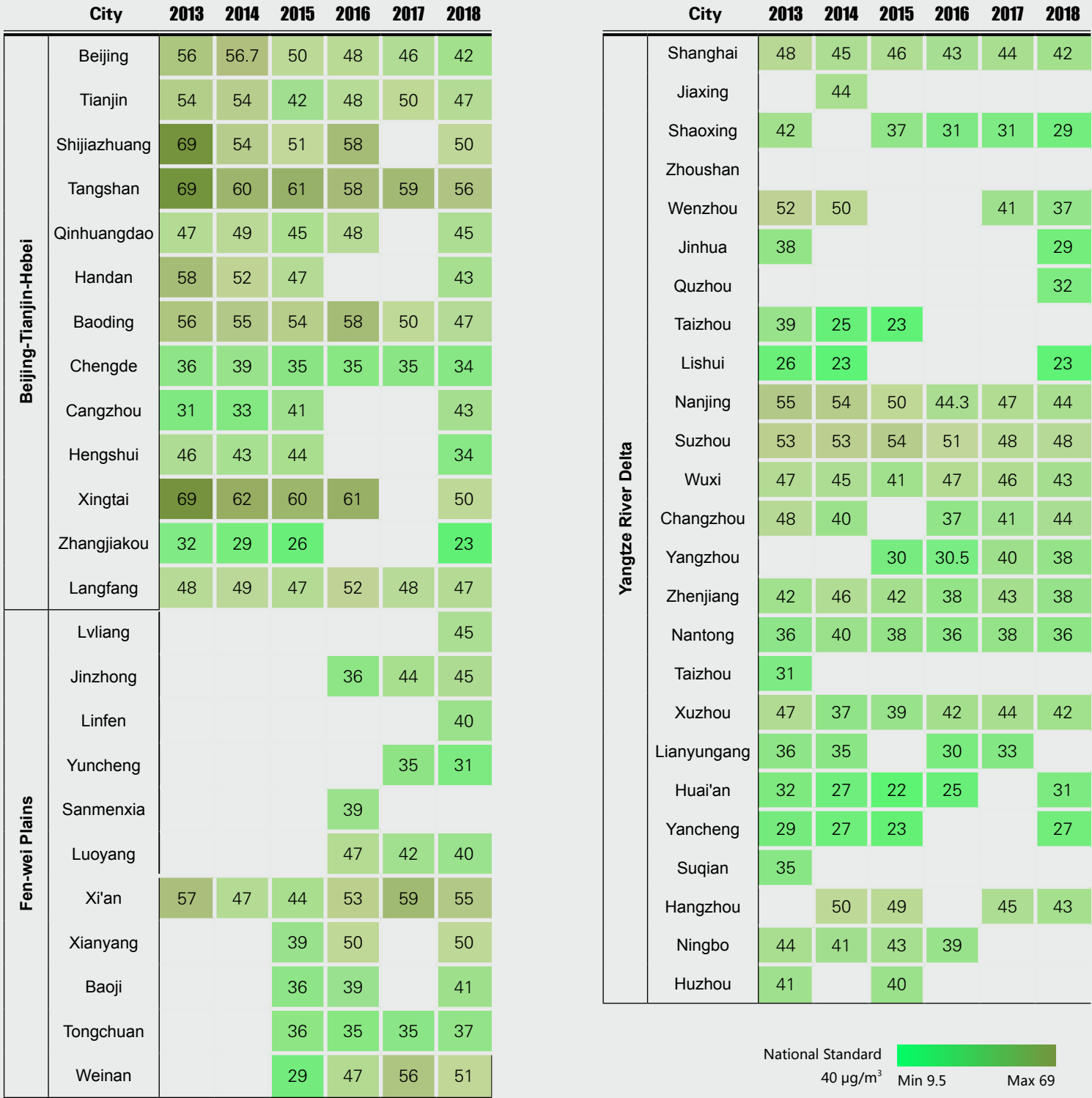


Figure 6 2013-2018 Annual Mean Concentration of NO₂ in 338 Cities



	City	2013	2014	2015	2016	2017	2018
Shandong	Laiwu						
	Linyi					45	42
	Dezhou				40		36.8
Fujian	Fuzhou	43			30		26
	Xiamen	44	37	31	31		31
	Quanzhou				27		25
	Putian				18		20
	Sanming				27		26
	Zhangzhou				31		30
	Nanping				18		17
	Longyan				25		24
	Ningde				26	22	20
Anhui	Hefei			33	45	52	41
	Wuhu			36	45	49	41.8
	Maanshan			35	34		37.25
	Bengbu						37.9
	Huai'nan				35	31	28.75
	Huaibei					35	33
	Tongling				43	50	41
	Anqing				39	36	31
	Huangshan				21		16
	Chuzhou				39	40	40
	Fuyang					36	28
	Suzhou						42.5
	Lu'an				35	38	34
	Bozhou				36		28.75
	Chizhou				33	35	35
	Xuancheng				38	32	34

	City	2013	2014	2015	2016	2017	2018
Jiangxi	Nanchang	40		31	33	37	36
	Jiujiang				30	29	29
	Jingdezhen						16
	Pingxiang						26
	Xinyu						28.7
	Yingtian				24	26	24
	Ganzhou				24		25
	Ji'an						19.8
	Yichun						24.2
	Fuzhou						17.9
	Shangrao						22.5

South China

	City	2013	2014	2015	2016	2017	2018
Hubei	Wuhan	60	55	52	46	50	47
	Yichang			35	35	35	34
	Jingzhou			36	34	36	34
	Huangshi				31	37	36
	Ezhou				34	36	34
	Xiaogan				25	26	20
	Huanggang				25	27	24
	Xianning				19	18	23
	Shiyan				28	22	29
	Xiangyang				32	35	34
	Jingmen				35	38	34
	Suizhou				25	24	24
	Enshi Prefecture				19	23	24

	City	2013	2014	2015	2016	2017	2018
Hunan	Changsha		42	38	38	40	34
	Yueyang				25	25	23
	Changde			24	23	22	25
	Zhangjiajie			18	21	22	22
	Zhuzhou			35	35	36	33
	Xiangtan				37	37	35
	Hengyang				30	28	30
	Shaoyang				22	24	23
	Yiyang				29	29	25
	Chenzhou				27	26	26
	Yongzhou				24	22	25
	Huaihua				17	18	13
	Loudi				23	22	22
	Xiangxi Prefecture				19	19	19
Guangxi	Nanning	38	37	33	32	35	35
	Guilin			26	27	25	23
	Beihai						
	Liuzhou			24	24	26	24
	Wuzhou					26	
	Fangchenggang				17		19
	Qinzhou						
	Guigang						
	Yulin						
	Baise						
	Hezhou						
	Hechi				27	25	
	Laibin						
	Chongzuo						

	City	2013	2014	2015	2016	2017	2018
Guangdong	Shaoguan			25			
	Shantou			20	21	21	19
	Zhanjiang			15	14		14
	Maoming			15			
	Meizhou			23	25	28	28
	Shanwei			13			
	Heyuan			23	19		
	Yangjiang						
	Qingyuan				37	23	22
	Chaozhou						
	Jieyang			21	25	25	
	Yunfu						31
	Guangzhou	52	48	47	46	52	50
	Shenzhen	40	35	33	33	30	29
	Zhuhai	37		29	32		30
	Foshan	53	48	41	41	44	41
	Jiangmen	33	32	31	34	38	35
	Dongguan	45	42		34	41	39
	Zhongshan	43	32		34	36	32
	Huizhou						
	Zhaoqing		37	31	33	27	25
Hainan	Haikou			14	16	12	5
	Sanya			13		12	

City		2013	2014	2015	2016	2017	2018
Sichuan	Chengdu	63	59	53	54	53	48
	Mianyang			34	36	32	31.5
	Yibin			29		34	35
	Panzhihua			32	34	36	38
	Luzhou			33	29	35	35
	Zigong			31	33	37	30.9
	Deyang			29	25	28	29
	Nanchong						32.8
	Suining				24		29
	Neijiang				28		26
	Leshan			24.8	24.6	32.8	
	Meishan					34.9	
	Guang'an			24	27	27	
	Dazhou			41	39	40.2	
	Ziyang			20	27	27.2	
	Guangyuan			35.5	38.2	34.5	
	Ya'an			27	28	20.8	
	Bazhong					26.5	23.8
	Aba Prefecture					11	9.5
	Ganzi Prefecture						15.9
	Liangshan Prefecture					14	20.5
Tibet	Lhasa		21	24			
	Changdu Prefecture						
	Shannan Prefecture						
	Shigatse Prefecture						
	Naqu Prefecture						
	Ali Prefecture						
	Linzi Prefecture						
City		2013	2014	2015	2016	2017	2018
Yunnan	Chongqing	38	39	45	46	46	44
	Kunming	40		30	28	32	33
	Qujing						19
	Yuxi						
	Zhaotong						
	Lijiang						
	Chuxiong Prefecture				21	21	20
	Honghe Prefecture						
	Diqing Prefecture						
	Baoshan						12
	Puer						
	Lincang				12	20	
	Wenshan Prefecture					14.6	
	Xishuangbanna						
	Dali Prefecture						16
	Dehong Prefecture						
	Nujiang Prefecture						
Guizhou	Guiyang	33	31	28	29	27	25
	Zunyi			29	32	29	27
	Liupanshui				25	23	23
	Bijie				23	22	20
	Anshun				16	15	15
	Tongren				16	22	19
	Qianxi'nan Prefecture						
	Qiandongnan Prefecture				11	21	
	Qiannan Prefecture						

City		2013	2014	2015	2016	2017	2018
Gansu	Lanzhou	35	48		57	57	55
	Jiayuguan			27	26	25	26
	Jinchang				17		16
	Baiyin				27		26
	Tianshui				36		34
	Wuwei				27	28	26
	Zhangye				22	21	18
	Pingliang				39		35
	Jiuquan					27	12.3
	Qingyang						
	Dingxi				31	30	27
	Longnan					26	25
	Linxia Prefecture						21
	Gannan				22		23
Qinghai	Xi'ning	41	38	38	42	40	39
	Haidong Prefecture				41	36	39
	Haibei Prefecture				13	14	16
	Huangnan Prefecture				11	16	13
	Hainan Prefecture				16	15	20
	Guoluo Prefecture				17	16	16
	Yushu Prefecture				13	15	15
Ningxia	Haixi Prefecture				13	15	13
	Yinchuan	43		39		42	37
	Shizuishan						25
	Wuzhong				28		24
	Guyuan						37
	Zhongwei					26	32
City		2013	2014	2015	2016	2017	2018
Xinjiang	Urumqi	60	56	52	53	49	
	Karamay						
	Korla						21
	Turpan						
	Changli Prefecture					23	
	Ili Prefecture					38	
	Hami Prefecture						
	Bortala Prefecture						
	Aksu Prefecture						
	Kizilsu Prefecture						
	Kashi Prefecture						
	Hetian Prefecture					26	
	Tacheng Prefecture						
Shaanxi	Altay Prefecture						
	Wujiaqu						
	Shihezi						
	Xi'an	57	47	44	53	59	55
	Xianyang			39	50		50
	Tongchuan			36	35	35	37
	Yan'an						
	Baoji			36	39		41
	Weinan			29	47	56	51
	Hanzhong					32	29
	Yulin						
	Ankang						
	Shangluo				26		

City		2013	2014	2015	2016	2017	2018
Heilongjiang	Harbin	56	52	51	44		37
	Qiqihar			24	23	22	18
	Daqing			25		26	23
	Mudanjiang		32	25	26	26	
	Jixi				20		
	Hegang						
	Shuangyashan				22	21	19
	Yichun						
	Jiamusi						
	Qitaihe						
	Heihe					15	
	Suihua						
	Great Khingan						
Jilin	Changchun	44	47	45	40	40	35
	Jilin			37	30	29	27
	Siping				32	33	28
	Liaoyuan				28	30	27
	Tonghua				31	32	26
	Baishan				27	26	22
	Songyuan				23	20	16
	Baicheng				20	22	16
	Yanbian				23	22	21

City		2013	2014	2015	2016	2017	2018
Liaoning	Shenyang	43	52	48	40	40	39
	Dalian	24	27		30	28	27
	Anshan			38			34
	Fushun			34	33		
	Benxi			41	33	31	31
	Jinzhou			38		38	35
	Dandong						
	Yingkou			31	28		29
	Panjin						
	Huludao			37			33
	Fuxin				26		
	Liaoyang				29		
	Tieling				23	32	
	Zhaoyang				22		

CO

The annual mean concentration of CO continued to fall below the attainment level. Compared with 2017, the range of the 95th percentile of daily average concentrations of CO across all 338 cities changed from 0.5-5.1mg/m³ to 0.6-4.9mg/m³, and the average concentration was down from 1.7mg/m³ to 1.5mg/m³ in 2018, lower than the National Standard of 4mg/m³.

The percentage of attainment cities grew from 98.8% to 99.7%, and only one city failed to comply with the standard.

All key regions reached the standard. Specifically, the BTH Region and its surrounding areas witnessed the largest decline from 2.9mg/m³ to 2.2mg/m³, down by 24.1%. The YRD saw its figure fall from 1.4mg/m³ to 1.3mg/m³, down by 7.1%. The Fen-wei Plains declined from 2.7mg/m³ to 2.3mg/m³, or 14.8%. In addition, the PRD recorded a drop from 1.2mg/m³ to 1.1mg/m³, down by 8.3%.

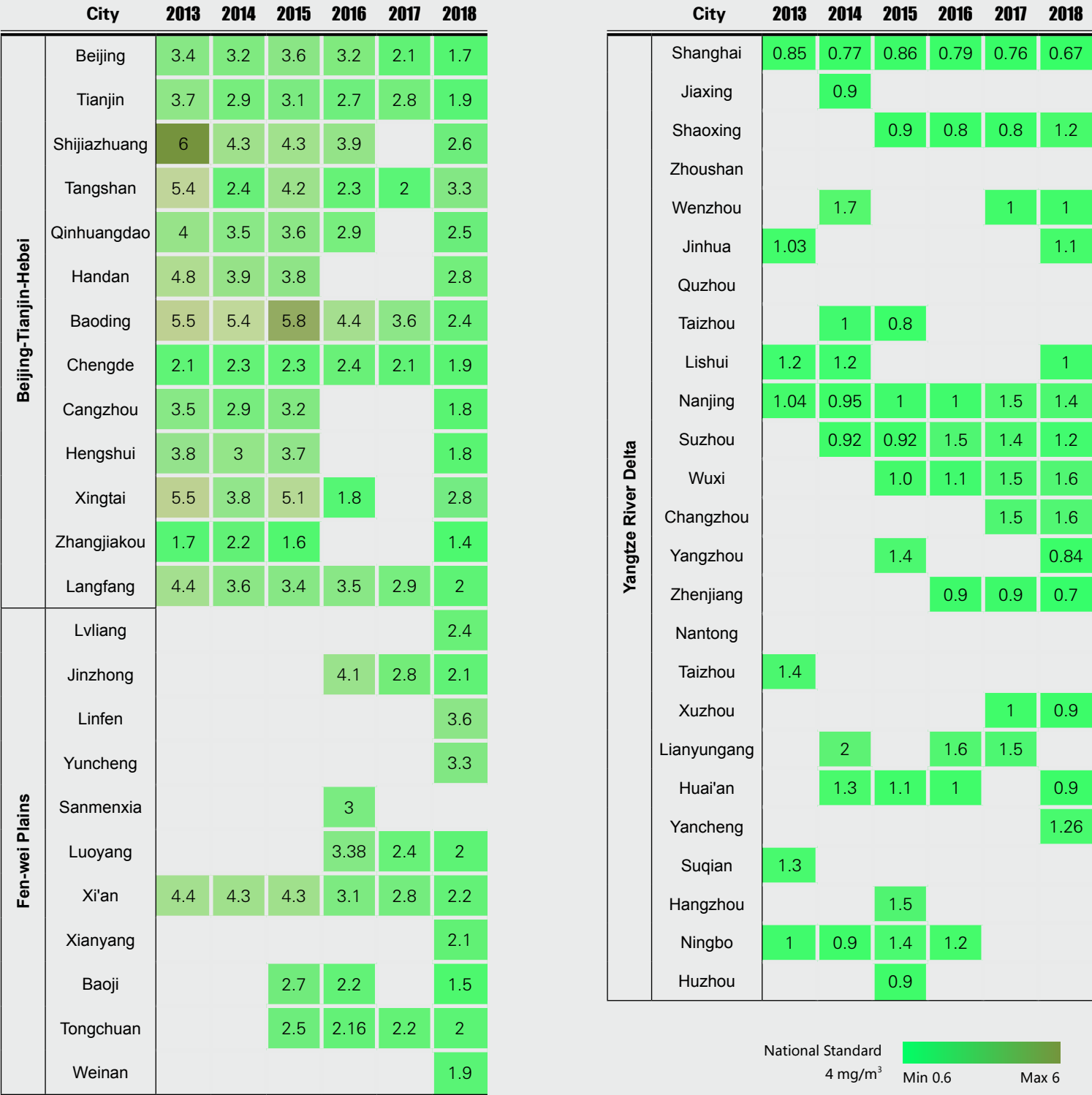
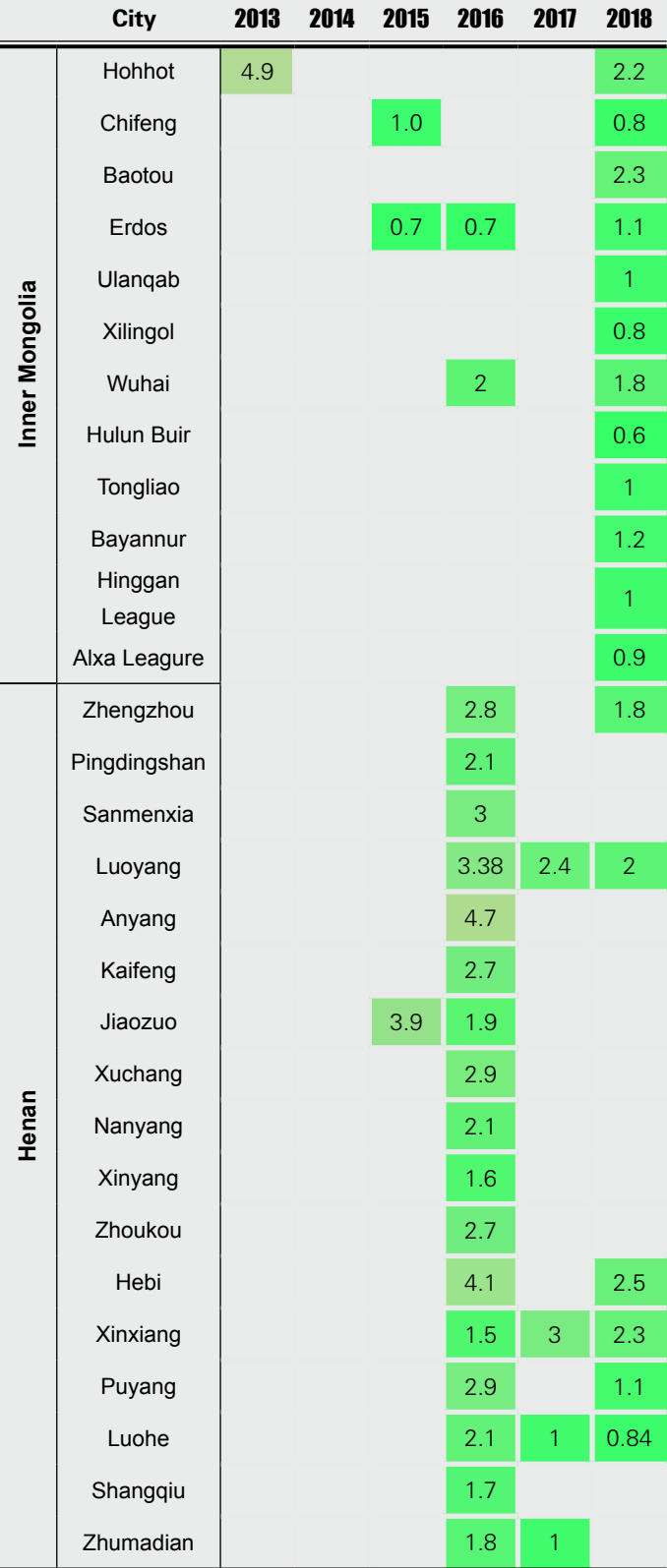


Figure 7 2013-2018 Annual Mean Concentration of CO in 338 Cities



City	2013	2014	2015	2016	2017	2018
Taiyuan	3.4	3.2		3.3		1.9
Datong						3.1
Changzhi					3.1	2.4
Linfen						3.6
Yangquan						2.2
Jincheng				4.1	4.3	2.9
Shuozhou						1.9
Jinzhong				4.1	2.8	2.1
Yuncheng						3.3
Xinzhou				3.5		2
Lvliang						2.4

	City	2013	2014	2015	2016	2017	2018
Shandong	Ji'nan						1.7
	Qingdao					1.3	1.4
	Zibo					2.6	2.1
	Zaozhuang						
	Yantai			0.8	0.8	0.7	1.3
	Weifang						
	Ji'ning						
	Tai'an						
	Rizhao						
	Dongying						1.5
	Liaocheng						1.9
	Binzhou						
	Heze						
	Weihai				1.1		

		City	2013	2014	2015	2016	2017	2018
Shandong		Laiwu						
		Linyi					2	1.9
		Dezhou						
Fujian		Fuzhou				1.1		0.9
		Xiamen	1	0.9	0.9			0.9
		Quanzhou				1		0.8
		Putian				0.9		0.8
		Sanming				2.1		1.7
		Zhangzhou				1.2		1
		Nanping				1.4		1
		Longyan				1.2		1
		Ningde				1.6	1.1	1.2
		Hefei		1.06	1	1.4		1.5
Anhui		Wuhu						
		Maanshan		1.5	2.1			1.7
		Bengbu						1.2
		Huai'nan				1	0.8	1.2
		Huaibei					1.5	1.4
		Tongling				1.31	1.1	1
		Anqing				1.3	1.1	1.1
		Huangshan				0.5		1.1
		Chuzhou				0.9	0.8	0.7
		Fuyang					0.9	0.75
		Suzhou						1.3
		Lu'an				1.3	1.2	1.1
		Bozhou				1.12		1.3
		Chizhou				1.6	1.6	1.4
		Xuancheng				1.2	1.3	1.2

		City	2013	2014	2015	2016	2017	2018
Jiangxi		Nanchang				1.6	1.6	1.5
		Jiujiang						1.6
		Jingdezhen						1.1
		Pingxiang						2.2
		Xinyu						1.5
		Yingtian				1.1	1	1
		Ganzhou				1.8		2
		Ji'an						1.0
		Yichun						1.4
		Fuzhou						1.05
		Shangrao						1.2

South China

		City	2013	2014	2015	2016	2017	2018
Hubei		Wuhan	1.1	1.1	1.1	1.7	1.1	1
		Yichang				1.7	1.7	1.6
		Jingzhou				1.8	1.7	1.8
		Huangshi				2.5	1.7	1.7
		Ezhou				1.8	1.6	1.7
		Xiaogan				2.8	3	1.6
		Huanggang				1.7	1.5	1.4
		Xianning				1.4	1.6	1.5
		Shiyan				1.9	1.7	1.4
		Xiangyang				2	1.8	1.6
		Jingmen				1.6	1.4	1.5
		Suizhou				2	2.6	1.5
		Enshi Prefecture				1.5	1.6	1.5

		City	2013	2014	2015	2016	2017	2018
Hunan		Changsha				1.4	1.3	1.3
		Yueyang				1.4	1.4	1.4
		Changde			1.4	1.8	1.8	1.4
		Zhangjiajie			1.6	2.2	1.9	1.4
		Zhuzhou			0.9	1.4	1.4	1.4
		Xiangtan				1.4	1.3	1.3
		Hengyang				1.8	1.7	1.6
		Shaoyang				1.5	1.5	1.4
		Yiyang				1.7	1.8	1.8
		Chenzhou				1.8	1.9	1.8
		Yongzhou				1.1	1	1.1
		Huaihua				1.6	1.4	1.5
		Loudi				2.5	2.6	2.3
		Xiangxi Prefecture				1	1.8	1.2
Guangxi		Nanning	1.7	1.6		1.3		1.3
		Guilin			1.8	1.7	1.3	1.3
		Beihai						
		Liuzhou				1.6	1.5	1.4
		Wuzhou					1.5	
		Fangchenggang						1.3
		Qinzhou						
		Guigang						
		Yulin						
		Baise						
		Hezhou						
		Hechi				1.6	1.3	
		Laibin						
		Chongzuo						

		City	2013	2014	2015	2016	2017	2018
Guangdong		Shaoguan			1			
		Shantou			1.2	1.2	1.1	1
		Zhanjiang			1.4	1.2		0.9
		Maoming			0.9			
		Meizhou			1.3	1.3	1.3	1.2
		Shanwei			0.8			
		Heyuan			1.3	1.2		
		Yangjiang						
		Qingyuan				1.6	1.5	1.3
		Chaozhou						
		Jieyang			1.5	1.5	1.3	
		Yunfu						1.2
		Guangzhou	1		1	1.3	1.2	1.2
		Shenzhen	1.2	1.1	0.9	0.8	0.8	0.6
		Zhuhai	1		1.6	1.1		1
		Foshan	1.6	1.6	1.4	1.3	1.2	1.2
		Jiangmen	2.1		1.5	1.3	1.3	1.2
Hainan		Dongguan	0.9	1.4		1.3	1.2	
		Zhongshan	1.5	1.7		1.4	1.3	1.1
		Huizhou						
		Zhaoqing		1.8	1.5	1.4	1.3	1.2
		Haikou			0.9	0.9	0.8	0.8
		Sanya			0.8		0.8	

City		2013	2014	2015	2016	2017	2018
Sichuan	Chengdu	2.6	2	2	1.8	1.7	1.4
	Mianyang			1.4	1.6	1.4	1.1
	Yibin			0.9		1.2	0.9
	Panzhihua			2.7	2.2	2.2	2.5
	Luzhou			0.9	0.9	1	1
	Zigong			1.5	1.5	1.6	1.4
	Deyang			1.4	1.4	1.5	1.3
	Nanchong						1.2
	Suining				1.4		1.1
	Neijiang				1.4		1.2
	Leshan				1.1	1.4	1.2
	Meishan						1.1
	Guang'an				1.4	1.5	1.3
	Dazhou				1.9	1.9	1.9
	Ziyang				1.2	1.2	1
	Guangyuan				0.8	1.5	1.3
	Ya'an				1.6	1.2	1.1
	Bazhong					1.5	1.1
	Aba Prefecture					1.3	0.8
	Ganzi Prefecture						0.7
	Liangshan Prefecture					1	1.2
Tibet	Lhasa			1.1	1		
	Changdu Prefecture						
	Shannan Prefecture						
	Shigatse Prefecture						
	Naqu Prefecture						
	Ali Prefecture						
	Linzi Prefecture						
City		2013	2014	2015	2016	2017	2018
Yunnan	Chongqing	1.5	1.8	1.5	1.4	1.4	1.3
	Kunming			1.0	1.0	0.9	1.2
	Qujing						1.4
	Yuxi						
	Zhaotong						
	Lijiang						
	Chuxiong Prefecture				0.8	0.9	0.7
	Honghe Prefecture						
	Diqing Prefecture						
	Baoshan						0.6
	Puer						
	Lincang				1.0	0.9	
	Wenshan Prefecture					0.7	
	Xishuangbanna						
	Dali Prefecture						0.7
	Dehong Prefecture						
	Nujiang Prefecture						
Guizhou	Guiyang	1.3	1.3	1.1	1.1	1.1	1
	Zunyi			1.2	1.2	1.1	1.1
	Liupanshui				1.3	1.1	1.2
	Bijie				1.6	1.7	1.3
	Anshun				1.1	0.9	1
	Tongren				1.2	1.3	1.4
	Qianxi'nan Prefecture						
	Qiandongnan Prefecture				1.3	1.2	
	Qiannan Prefecture						

City		2013	2014	2015	2016	2017	2018
Gansu	Lanzhou				2.9	2.8	2.7
	Jiayuguan				1	1	1
	Jinchang				1.9		0.9
	Baiyin				1.4		1.6
	Tianshui				2		1.6
	Wuwei				2.7	1.8	1.6
	Zhangye						1
	Pingliang						
	Jiuquan					1	1.6
	Qingyang						
	Dingxi					1.6	1.4
	Longnan					2	0.8
	Linxia						
	Gannan				2.2		1.5
Qinghai	Xi'ning	1.8	1.3		3.2	2.8	2.8
	Haidong Prefecture				2.3	2.5	1.6
	Haibei Prefecture				1	0.9	1.1
	Huangnan Prefecture				1.6	1.4	1.5
	Hainan Prefecture				0.8	1.4	1.3
	Guoluo Prefecture				1.2	1.3	1.2
	Yushu Prefecture				1.2	1.1	1.1
Ningxia	Haixi Prefecture				1.3	1	1.1
	Yinchuan	1.2		2.5		2.5	2.1
	Shizuishan						1.2
	Wuzhong				1.6		1.2
	Guyuan						2.1
	Zhongwei					1.4	1.7
City		2013	2014	2015	2016	2017	2018
Xinjiang	Urumqi	5.7	1.4		1.5		
	Karamay						
	Korla						
	Turpan						
	Changli Prefecture					1.1	
	Ili Prefecture					1.8	
	Hami Prefecture						
	Bortala Prefecture						
	Aksu Prefecture						
	Kizilsu Prefecture						
	Kashi Prefecture						
	Hetian Prefecture					1.3	
	Tacheng Prefecture						
	Altay Prefecture						
Shaanxi	Wujiaqu						
	Shihezi						
	Xi'an	4.4	4.3	4.3	3.1	2.8	2.2
	Xianyang						2.1
	Tongchuan			2.5	2.16	2.2	2
	Yan'an						
	Baoji			2.7	2.2		1.5
	Weinan						1.9
	Hanzhong					2.4	2.1
	Yulin						
	Ankang						
	Shangluo				1.2		

City		2013	2014	2015	2016	2017	2018
Heilongjiang	Harbin				2		
	Qiqihar			1.5	1.5	1.5	1.1
	Daqing			0.6		1.3	1
	Mudanjiang						
	Jixi						
	Hegang						
	Shuangyashan				0.81	0.75	0.7
	Yichun						
	Jiamusi						
	Qitaihe						
	Heihe					1	
	Suihua						
	Great Khingan						
	Changchun	2.1	1.5	1.8	1.6	1.9	1.3

Jilin	Jilin			1.9	1.5	1.8	1.5
	Siping				1.5	1.8	1.5
	Liaoyuan				1.9	1.8	1.6
	Tonghua				2.3	2	1.8
	Baishan				1.9	1.6	1.6
	Songyuan				1.4	1.6	1.2
	Baicheng				1.1	1.1	1.2
	Yanbian				1.4	1.4	1.2

City		2013	2014	2015	2016	2017	2018
Liaoning	Shenyang			1	1.7	1.7	1.8
	Dalian					1.4	1.3
	Anshan			2.7			2.2
	Fushun			2.5	2.1		
	Benxi			2.9	2.1	2.3	2.2
	Jinzhou			2.3		2	1.8
	Dandong						
	Yingkou			1			1.7
	Panjin						
	Huludao			1.5			1.7
	Fuxin				1.2		
	Liaoyang						
	Tieling				1.4	1.2	
	Zhaoyang						

O₃

O₃ was the only pollutant which registered a rise in annual average concentration rather than a fall. In 2018, the range of the 90th percentile of the daily maximum 8-hour average concentration of O₃ changed from 78-218µg/m³ to 76-217µg/m³. Although the average concentration complied with the National Standard (160µg/m³), the figure rose from 149µg/m³ to 151µg/m³.

The percentage of attainment cities declined from 67.8% to 65.4% at a slower rate year on year.

All the key regions failed to comply with the standard, making it the primary pollutant with the most non-attainment days in the BHT Region and its surrounding areas as well as the YRD, and the concentration in the two regions kept rising from 198µg/m³ to 199µg/m³ and from 166µg/m³ to 167µg/m³ respectively, up by 1µg/m³. The Fen-wei Plains’ concentration fell from 185µg/m³ to 180µg/m³, or 2.7%, resulting in the region’s second-most non-attainment days for a major pollutant, behind only PM_{2.5}. In addition, the PRD saw its figure drop from 165µg/m³ to 164µg/m³, but O₃ is still responsible for the region’s most non-attainment days among all criteria pollutants.

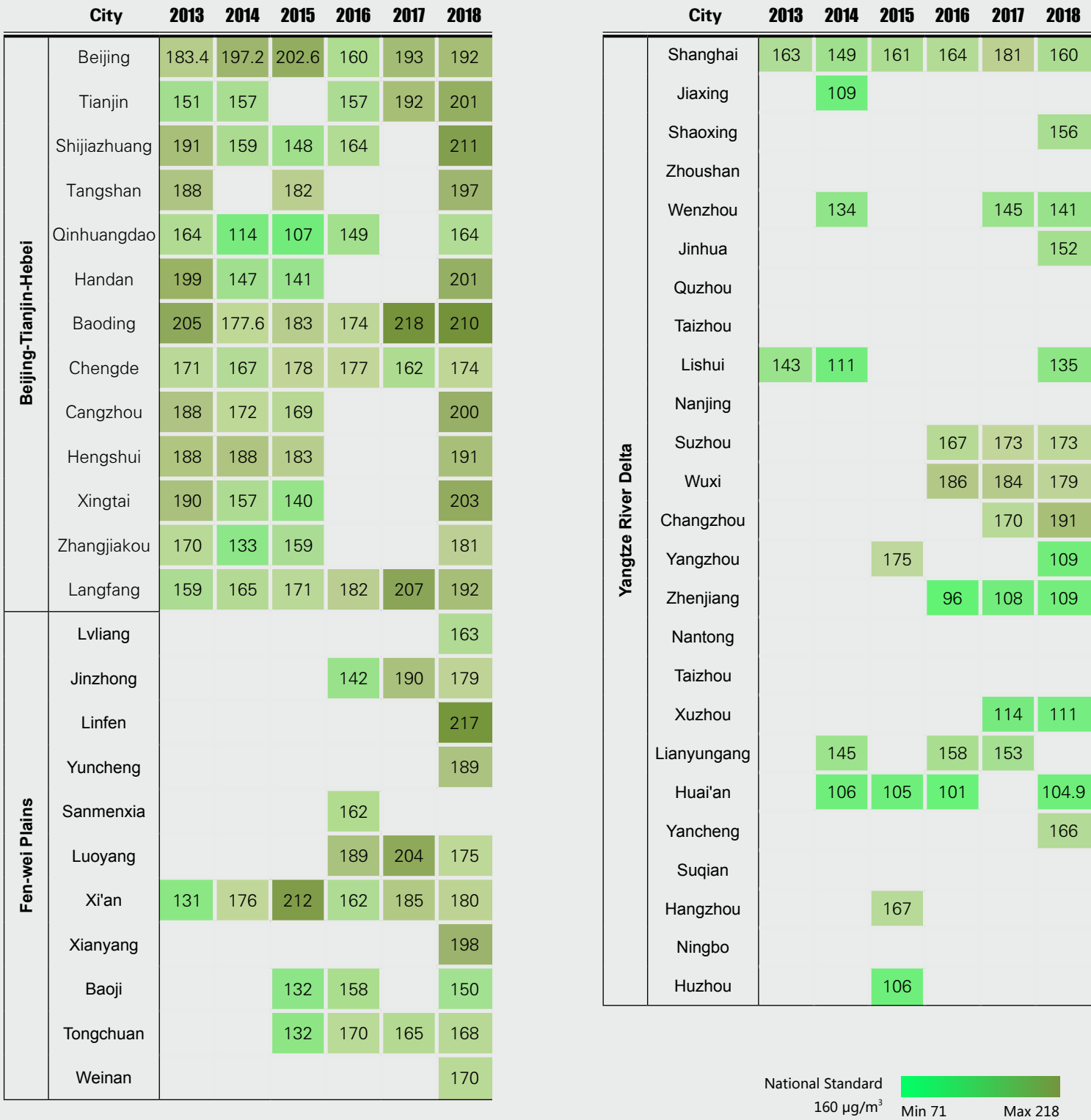
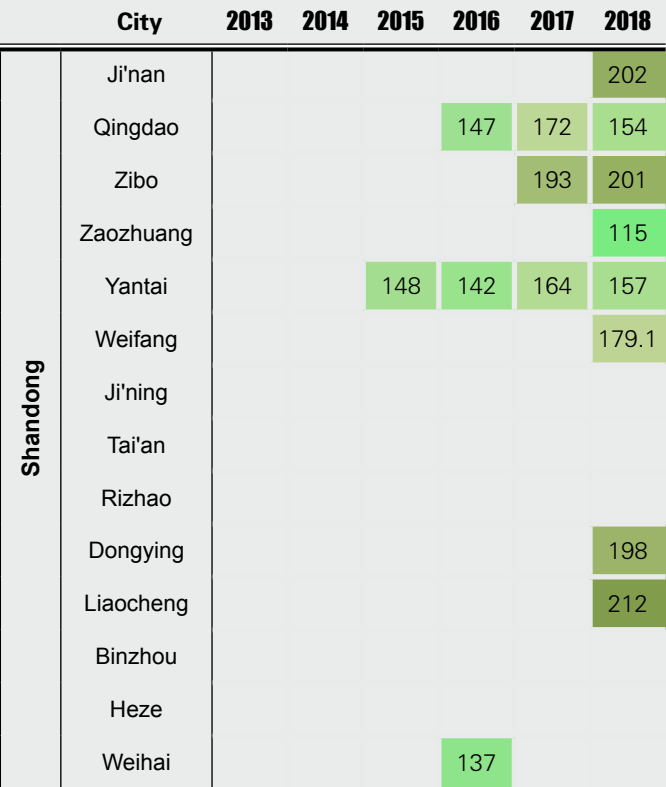
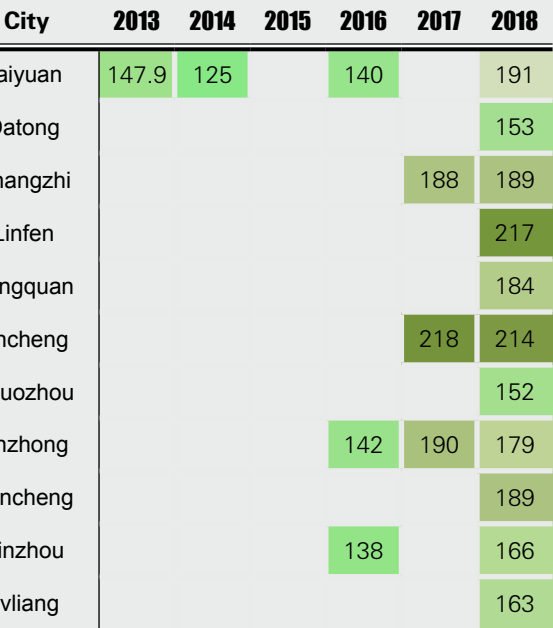
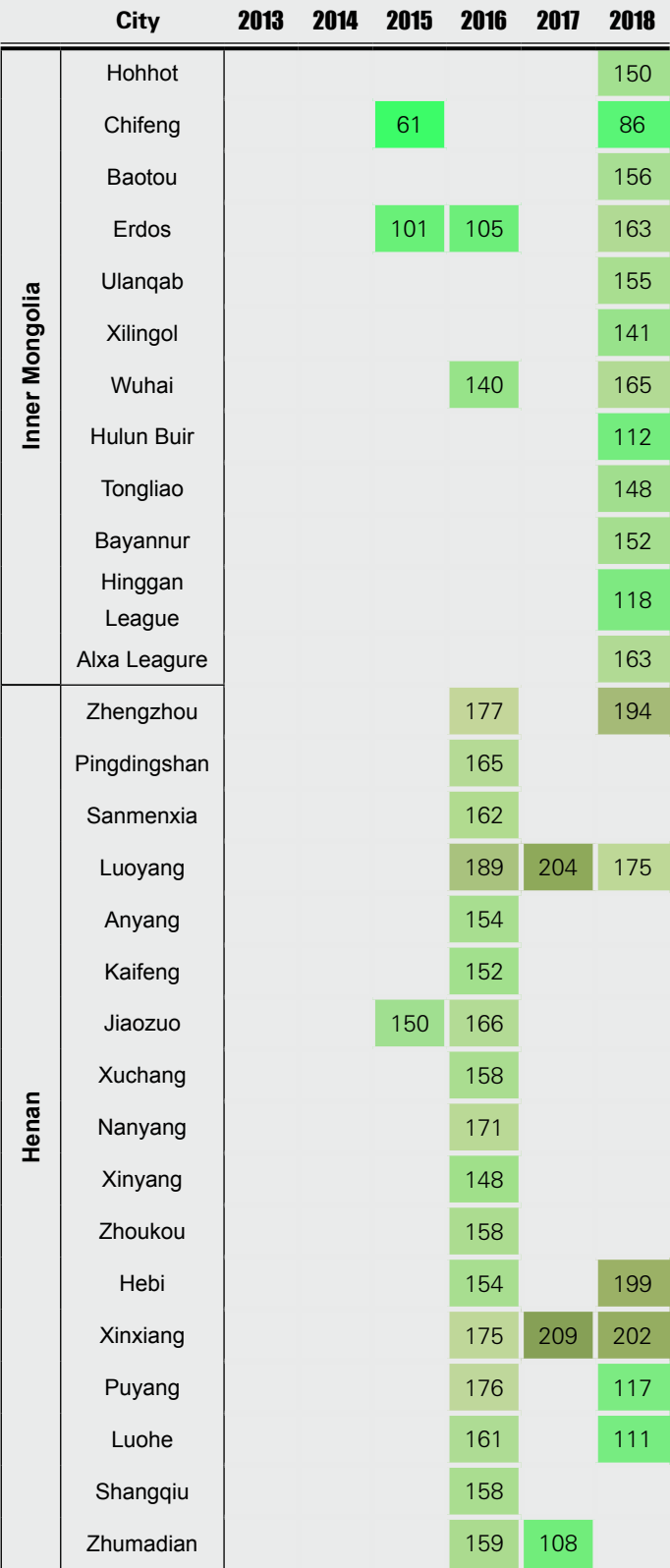


Figure 8 2013-2018 Annual Mean Concentration of O₃ in 338 Cities



	City	2013	2014	2015	2016	2017	2018
Shandong	Laiwu						
	Linyi					184	185
	Dezhou						
Fujian	Fuzhou				114		151
	Xiamen	128	95	103			127
	Quanzhou				109		150
	Putian				129		156
	Sanming				106		124
	Zhangzhou				114		155
	Nanping				112		128
	Longyan				125		129
	Ningde				120	124	148
Anhui	Hefei					170	168
	Wuhu						
	Maanshan				158		183
	Bengbu						167.7
	Huai'nan					109	167
	Huaibei					184	183
	Tongling				81		89
	Anqing				130	136	163
	Huangshan				72		95
	Chuzhou					115	113
	Fuyang						104
	Suzhou						171.6
	Lu'an				146	156	166
	Bozhou						170.3
	Chizhou				130	138	158
	Xuancheng					142	137

	City	2013	2014	2015	2016	2017	2018
Jiangxi	Nanchang				138	146	144
	Jiujiang						153
	Jingdezhen						118.8
	Pingxiang						140
	Xinyu						124
	Yingtian				139	151	154
	Ganzhou				128		153
	Ji'an						136
	Yichun						122.4
	Fuzhou						127.9
	Shangrao						120.7

South China

	City	2013	2014	2015	2016	2017	2018
Hubei	Wuhan				160	151	
	Yichang			122	126	137	143
	Jingzhou				156	140	157
	Huangshi				158	145	164
	Ezhou				156	139	165
	Xiaogan				160	158	158
	Huanggang				176	159	175
	Xianning				158	156	163
	Shiyan				122	130	145
	Xiangyang				152	152	155
	Jingmen				130	145	154
	Suizhou				152	148	156
	Enshi Prefecture				94	121	96

	City	2013	2014	2015	2016	2017	2018
Hunan	Changsha				150	153	161
	Yueyang				158	142	155
	Changde				136	147	151
	Zhangjiajie				124	129	130
	Zhuzhou				142	142	148
	Xiangtan				142	142	153
	Hengyang				132	141	130
	Shaoyang				137	138	134
	Yiyang				150	143	140
	Chenzhou				126	140	137
	Yongzhou				124	129	138
	Huaihua				122	122	121
	Loudi				139	134	143
	Xiangxi Prefecture				120	110	104
Guangxi	Nanning	125	126		114		128
	Guilin			138	135	139	136
	Beihai						
	Liuzhou				123	127	127
	Wuzhou					119	
	Fangchenggang						126
	Qinzhou						
	Guigang						
	Yulin						
	Baise						
	Hezhou						
	Hechi				119	110	
	Laibin						
	Chongzuo						

	City	2013	2014	2015	2016	2017	2018
Guangdong	Shaoguan						
	Shantou			141	132	140	152
	Zhanjiang			137	138		150
	Maoming						
	Meizhou			118	111	120	123
	Shanwei						
	Heyuan			134	124		
	Yangjiang						
	Qingyuan				144	128	127
	Chaozhou			163.2	90.5		
	Jieyang			136	130	146	
	Yunfu						134
	Guangzhou				155	162	174
	Shenzhen				135		137
	Zhuhai			142	144		162
	Foshan	169	167	140	160	174	172
Hainan	Jiangmen	164		146	162	193	184
	Dongguan		187	172	166	170	171
	Zhongshan	167	152		153	181	165
	Huizhou						
	Zhaoqing			147	150	143	145
	Haikou			103	107	127	116
	Sanya			113		110	

City		2013	2014	2015	2016	2017	2018
Sichuan	Chengdu	157	148	183	168	171	167
	Mianyang			137	136	134	151.6
	Yibin			72			92
	Panzhihua			118	112	119	140
	Luzhou			121	154	147	149
	Zigong			119	116	150	171.6
	Deyang			156	140	130	158
	Nanchong						151
	Suining				150		147
	Neijiang				157		152
	Leshan				143	129.4	128.6
	Meishan						155
	Guang'an				147	142	144
	Dazhou				114	123	143
	Ziyang				157	150	157.6
	Guangyuan				134	120.6	126
	Ya'an				119	132	124
	Bazhong					115	106.6
	Aba Prefecture					125	118.8
	Ganzi Prefecture						126
	Liangshan Prefecture					108	137
Tibet	Lhasa			142	151		
	Changdu Prefecture						
	Shannan Prefecture						
	Shigatse Prefecture						
	Naqu Prefecture						
	Ali Prefecture						
	Linzi Prefecture						
City		2013	2014	2015	2016	2017	2018
Yunnan	Chongqing	162	146	127	141	163	166
	Kunming			79	82		130
	Qujing						128
	Yuxi						
	Zhaotong						
	Lijiang						
	Chuxiong Prefecture				76		81
	Honghe Prefecture						
	Diqing Prefecture						
	Baoshan						91
	Puer						
	Lincang				72		
	Wenshan Prefecture					118	
	Xishuangbanna						
	Dali Prefecture						92
	Dehong Prefecture						
	Nujiang Prefecture						
Guizhou	Guiyang	109	103	120	130	121	118
	Zunyi			108	114	109	124
	Liupanshui				96	114	109
	Bijie				114	120	124
	Anshun				116	122	125
	Tongren				71		108
	Qianxi'nan Prefecture						
	Qiangongnan Prefecture				104	83	
	Qiannan Prefecture						

City		2013	2014	2015	2016	2017	2018
Gansu	Lanzhou				144	161	168
	Jiayuguan				138	148	140
	Jinchang				128		146
	Baiyin				112		133
	Tianshui				134		134
	Wuwei				140	138	143
	Zhangye						143
	Pingliang						
	Jiuquan					144	148.4
	Qingyang						
	Dingxi					144	134
	Longnan					119	86
Qinghai	Linxia Prefecture						
	Gannan				146		136
	Xi'ning				128	136	138
	Haidong Prefecture				130	142	153
	Haibei Prefecture				154	136	144
	Huangnan Prefecture				132	124	118
	Hainan Prefecture				149	130	120
	Guoluo Prefecture				132	140	142
Ningxia	Yinchuan		125			169	166
	Shizuishan						144
	Wuzhong				130		147
	Guyuan						166
	Zhongwei					157	157
City		2013	2014	2015	2016	2017	2018
Xinjiang	Urumqi	116					
	Karamay						
	Korla						
	Turpan						
	Changli Prefecture						
	Ili Prefecture						
	Hami Prefecture						
	Bortala Prefecture						
	Aksu Prefecture						
	Kizilsu Prefecture						
	Kashi Prefecture						
	Hetian Prefecture						
	Tacheng Prefecture						
	Altay Prefecture						
Shaanxi	Wujiaqu						
	Shihezi						
	Xi'an	131	176	212	162	185	180
	Xianyang						198
	Tongchuan			132	170	165	168
	Yan'an						
	Baoji			132	158		150
	Weinan						170
	Hanzhong					145	137
	Yulin						
	Ankang						
	Shangluo				98		

City		2013	2014	2015	2016	2017	2018
Heilongjiang	Harbin		198		106		
	Qiqihar			108	98	111	121
	Daqing					126	127
	Mudanjiang						
	Jixi						
	Hegang						
	Shuangyashan				54		79
	Yichun						
	Jiamusi						161
	Qitaihe						
	Heihe					100	
	Suihua						
	Great Khingan						
Jilin	Changchun	127	132	151	141	142	133
	Jilin			154	151	147	149
	Siping				130	142	159
	Liaoyuan				157	141	154
	Tonghua				129	120	140
	Baishan				136	126	134
	Songyuan				154	144	136
	Baicheng				119	123	135
	Yanbian				115	126	130

City		2013	2014	2015	2016	2017	2018
Liaoning	Shenyang			155	162	166	163
	Dalian				155	163	157
	Anshan						
	Fushun			149	162		
	Benxi			136	137	116	137
	Jinzhou			165	180	172	151
	Dandong						
	Yingkou			111			186
	Panjin						
	Huludao						137.2
	Fuxin						
	Liaoyang						
	Tieling				160	159	
	Zhaoyang						

PM_{2.5}

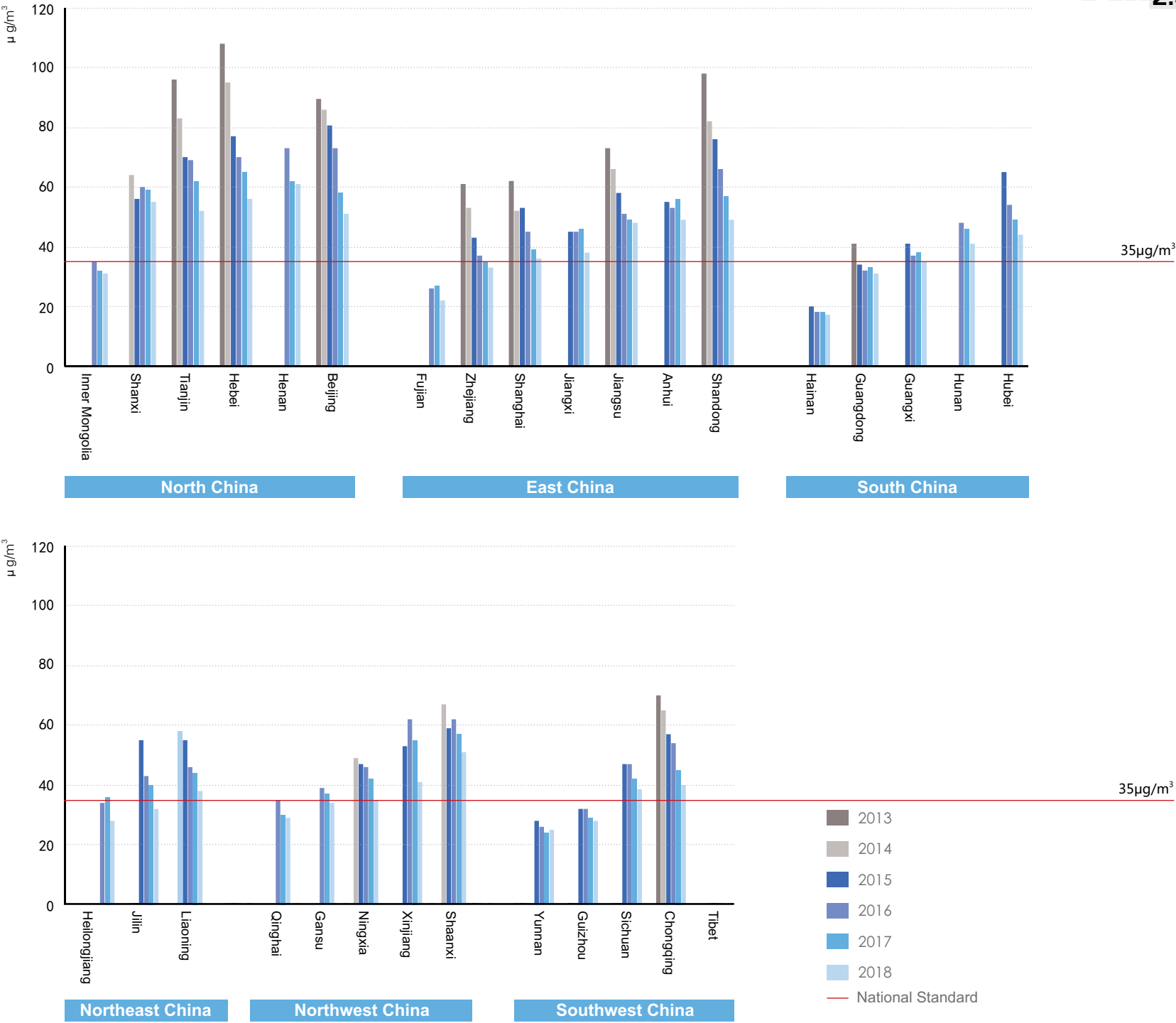


Figure 9 2013-2018 Annual Mean Concentration of PM_{2.5} by Province

PM₁₀

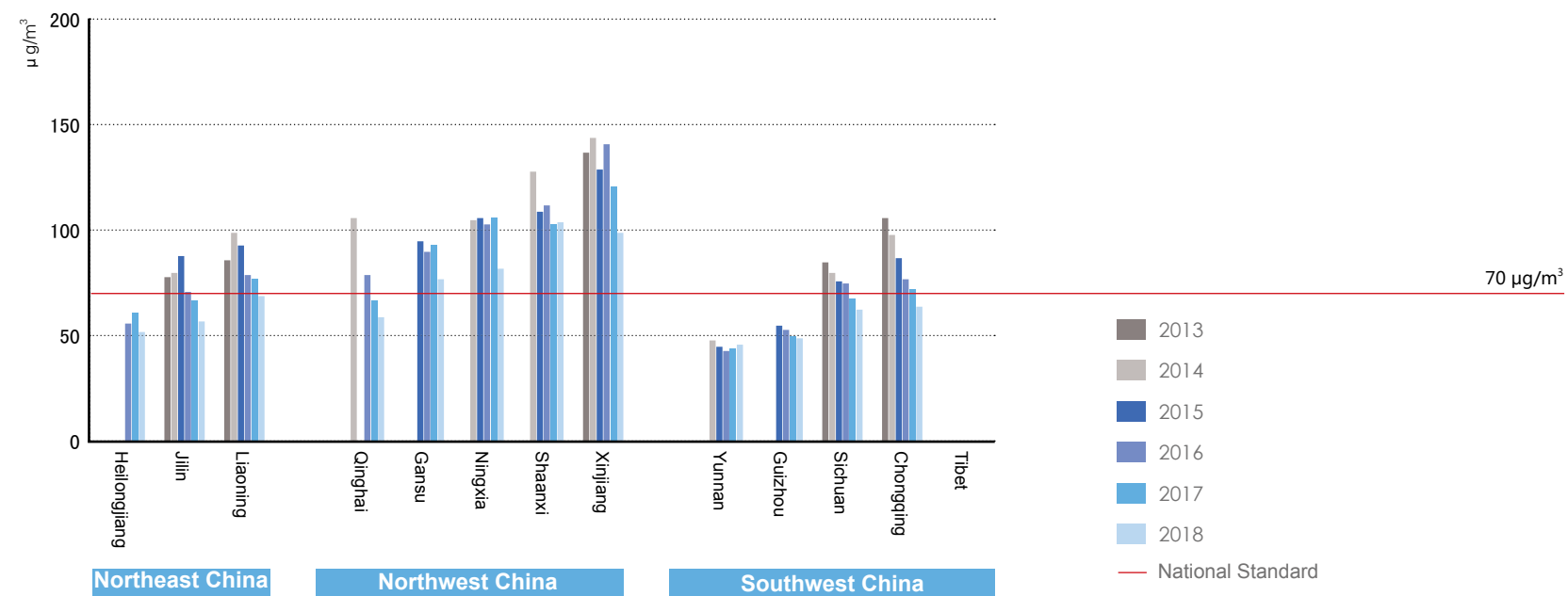
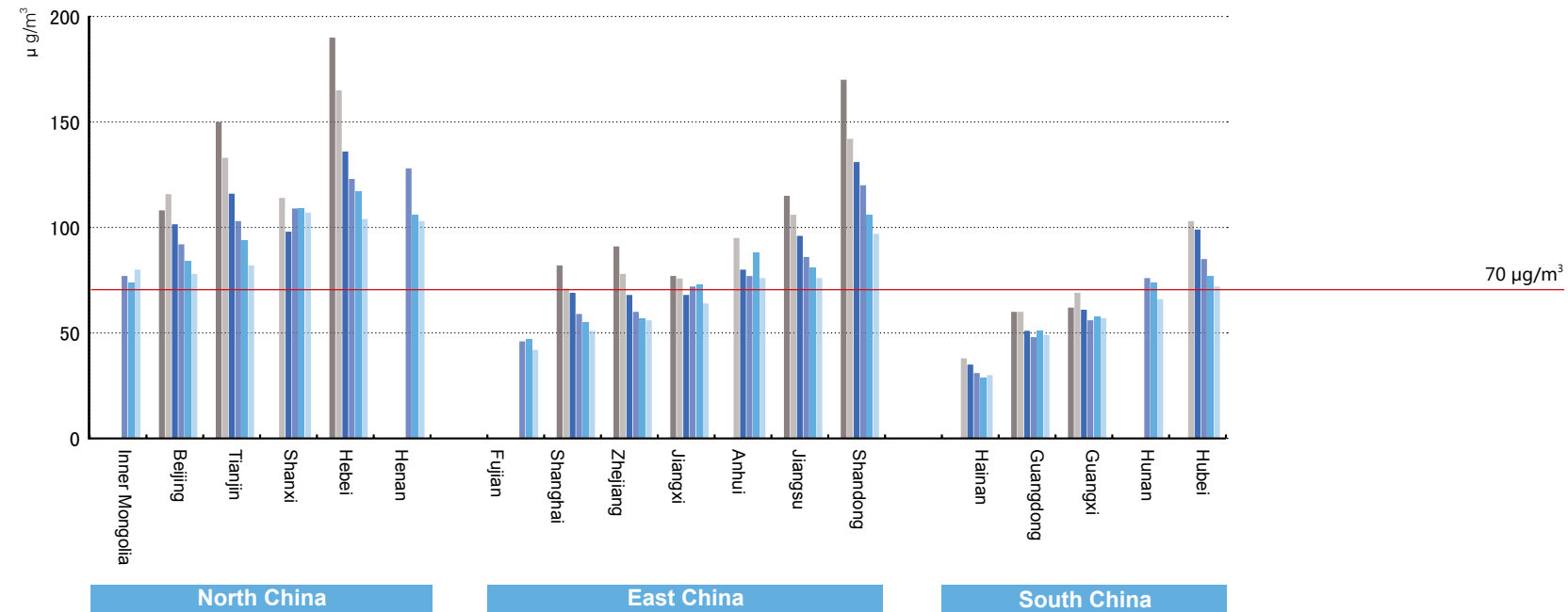


Figure 10 2013-2018 Annual Mean Concentration of PM₁₀ by Province

SO₂

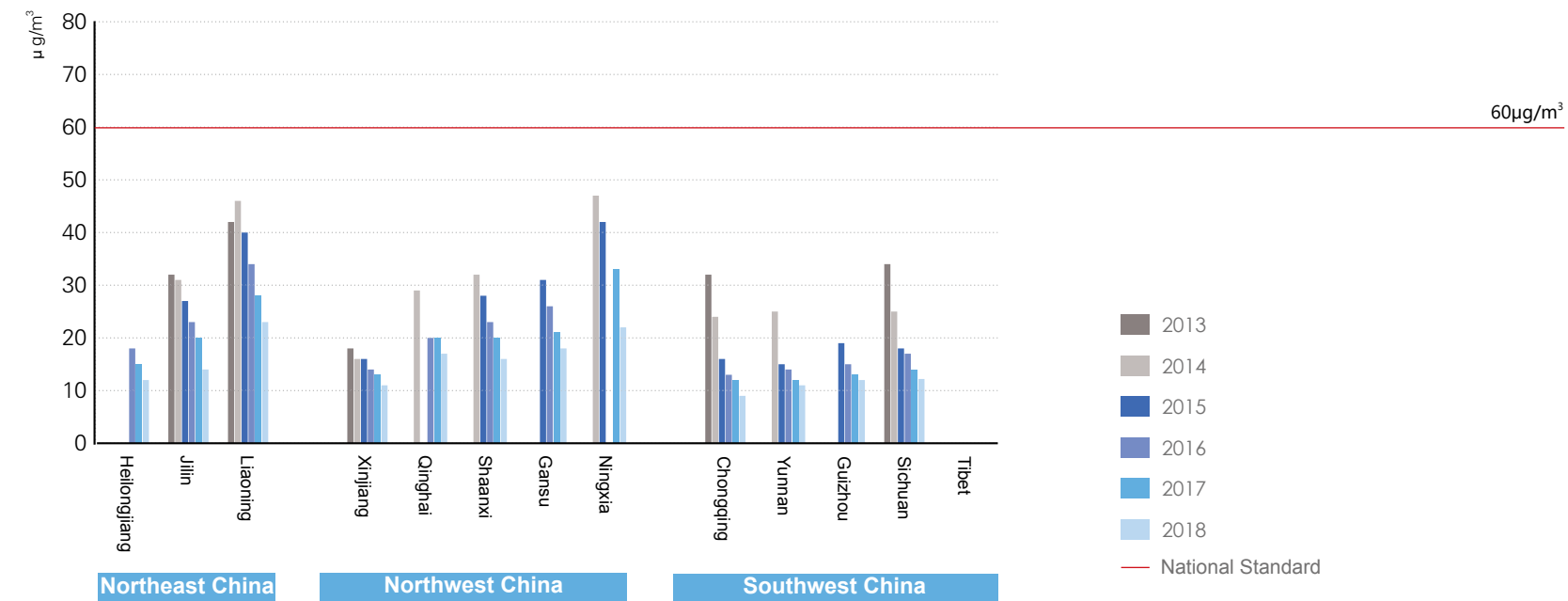
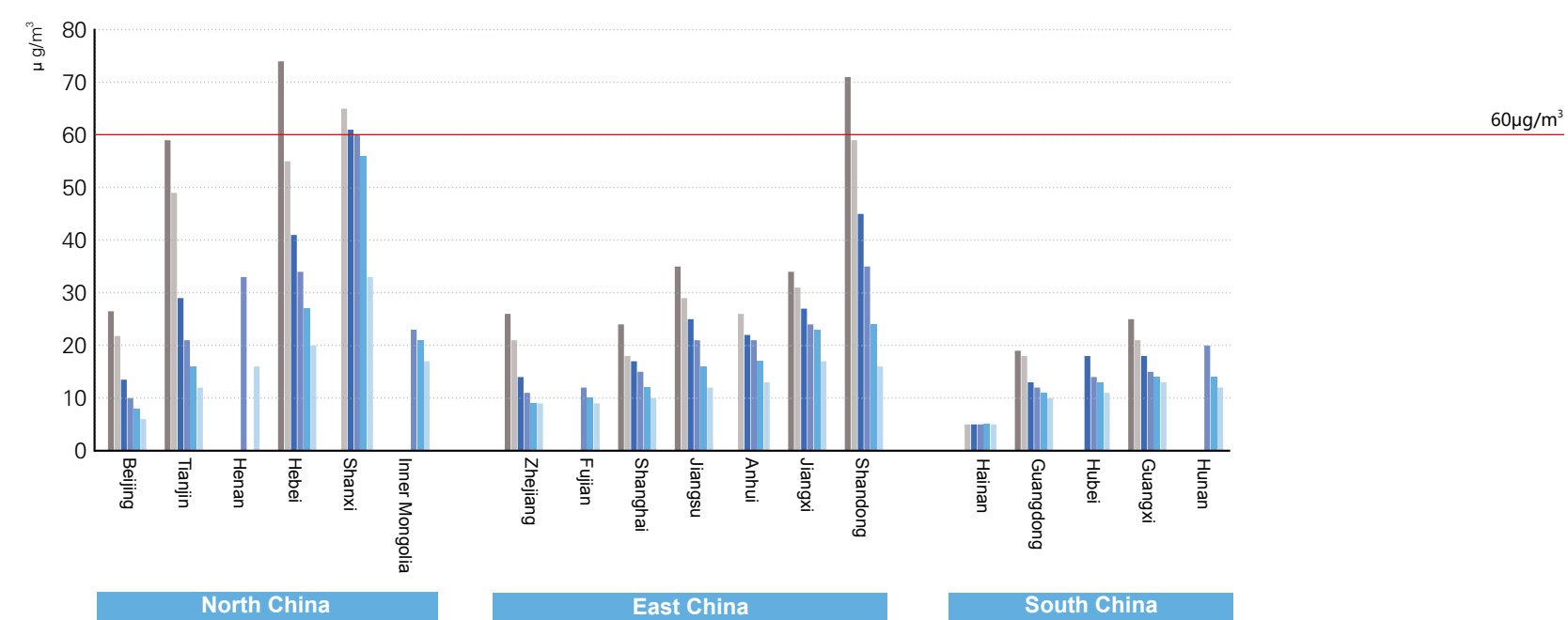


Figure 11 2013-2018 Annual Mean Concentration of SO₂ by Province

NO₂

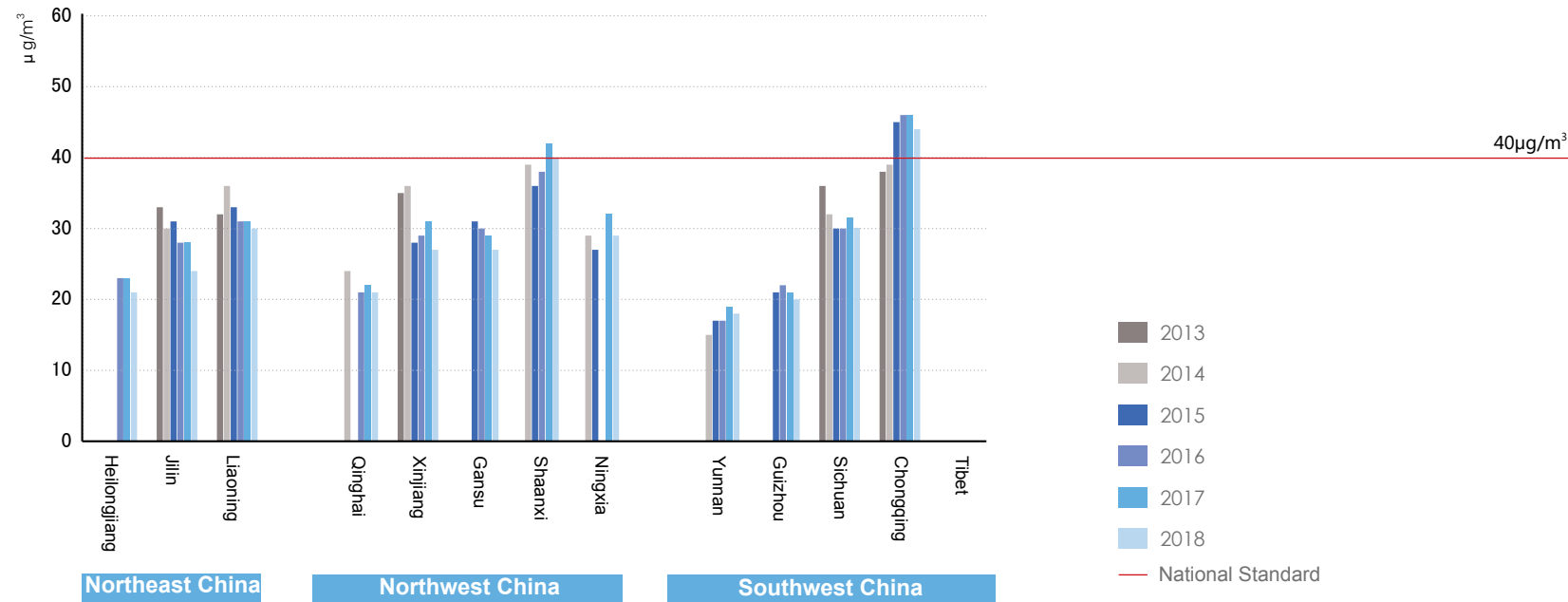
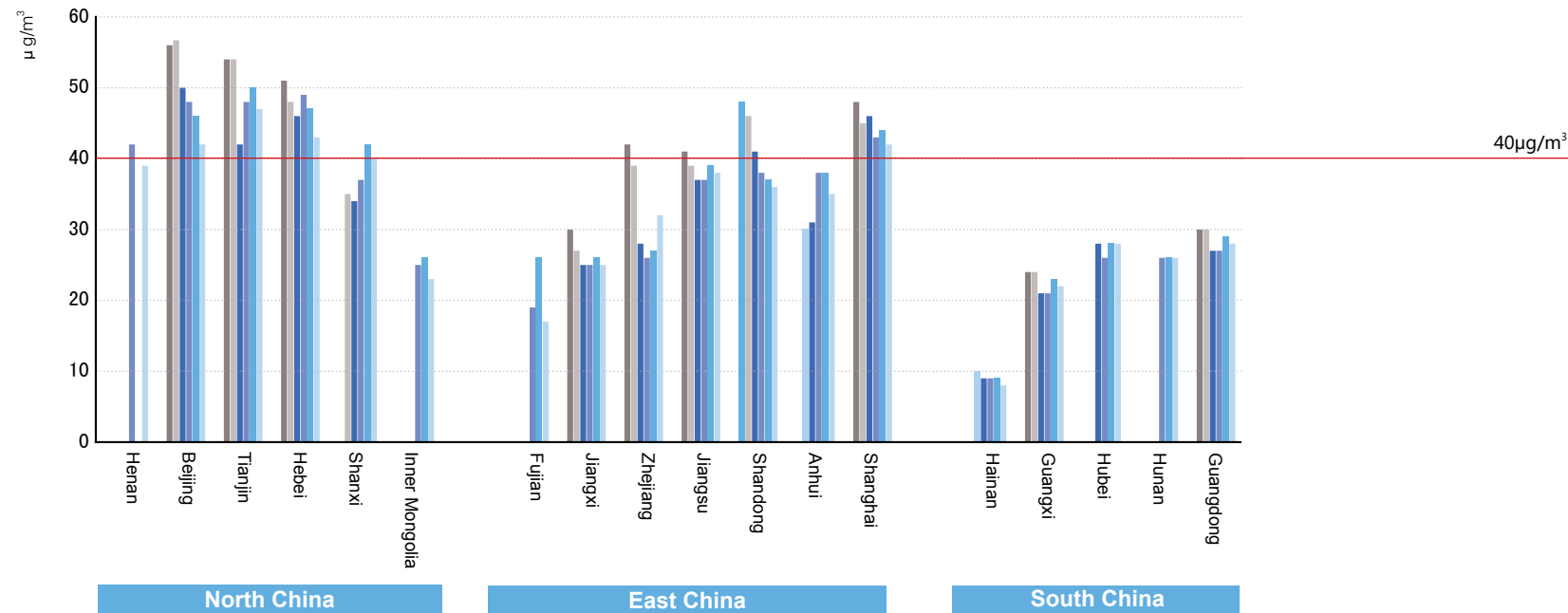


Figure 12 2013-2018 Annual Mean Concentration of NO₂ by Province

CO

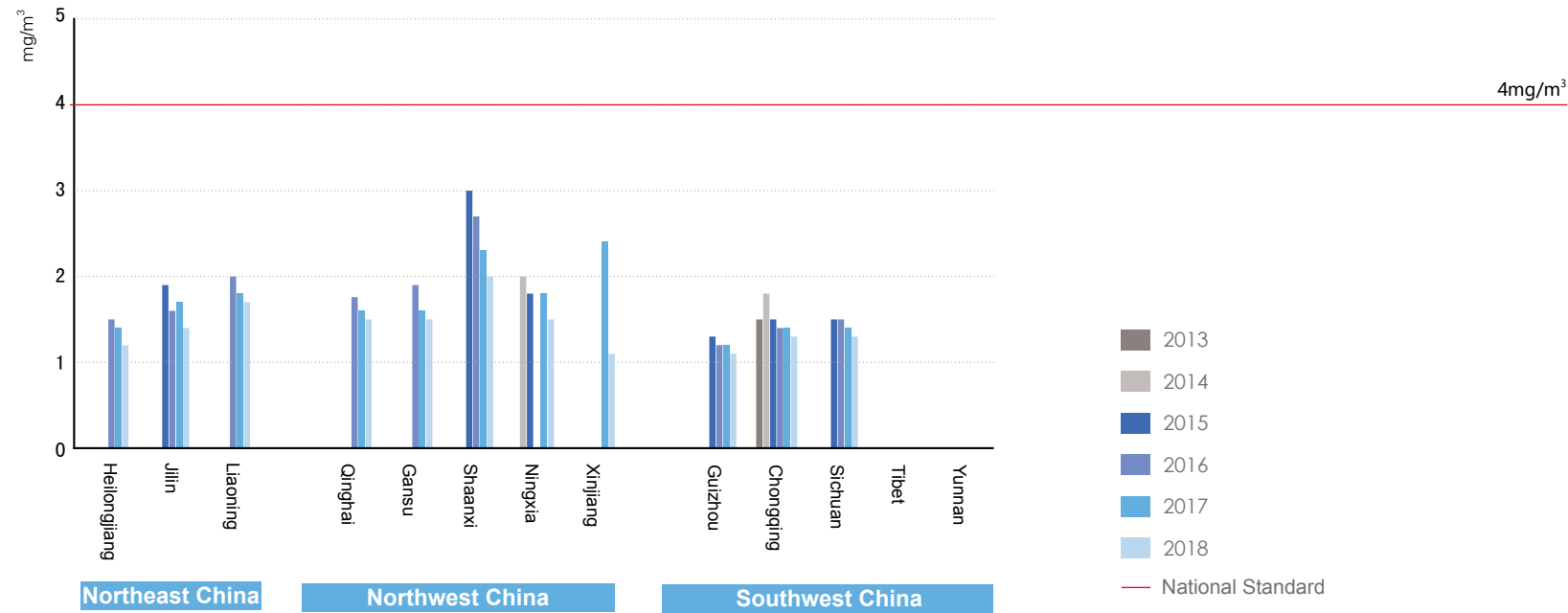
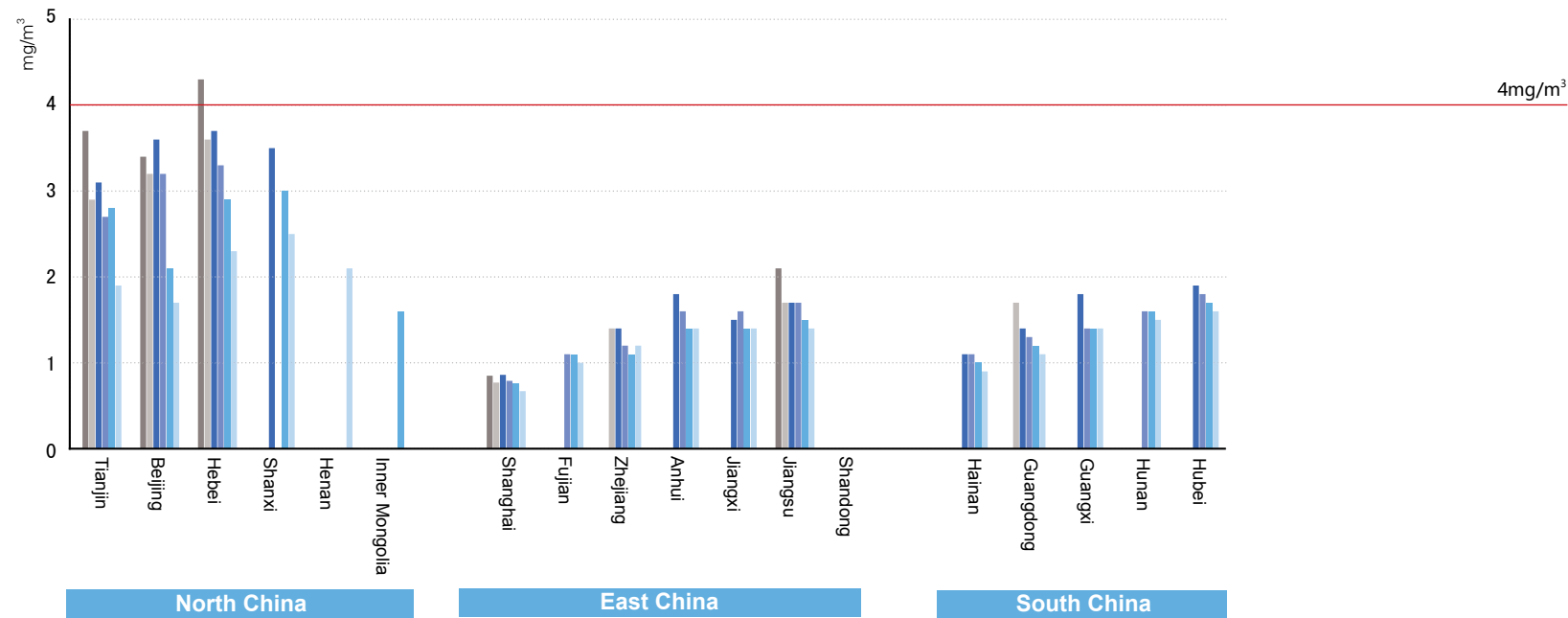


Figure 13 2013-2018 Annual Mean Concentration of CO by Province

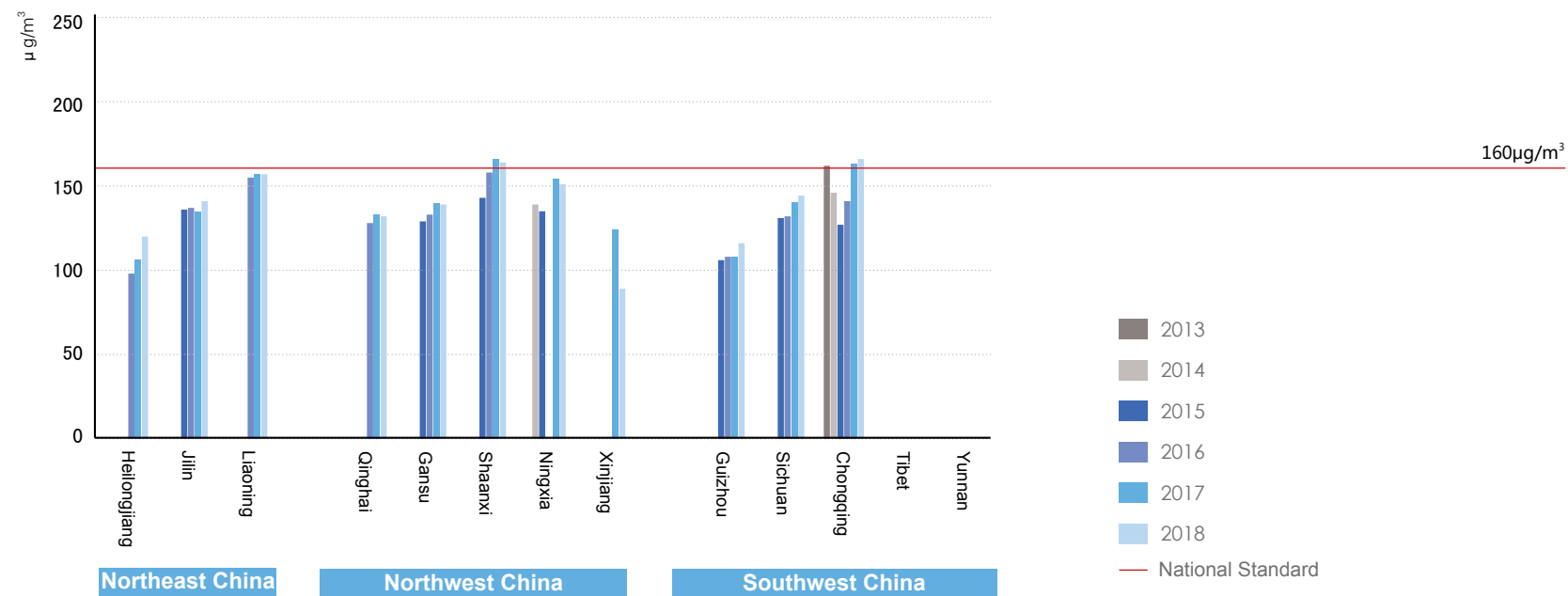
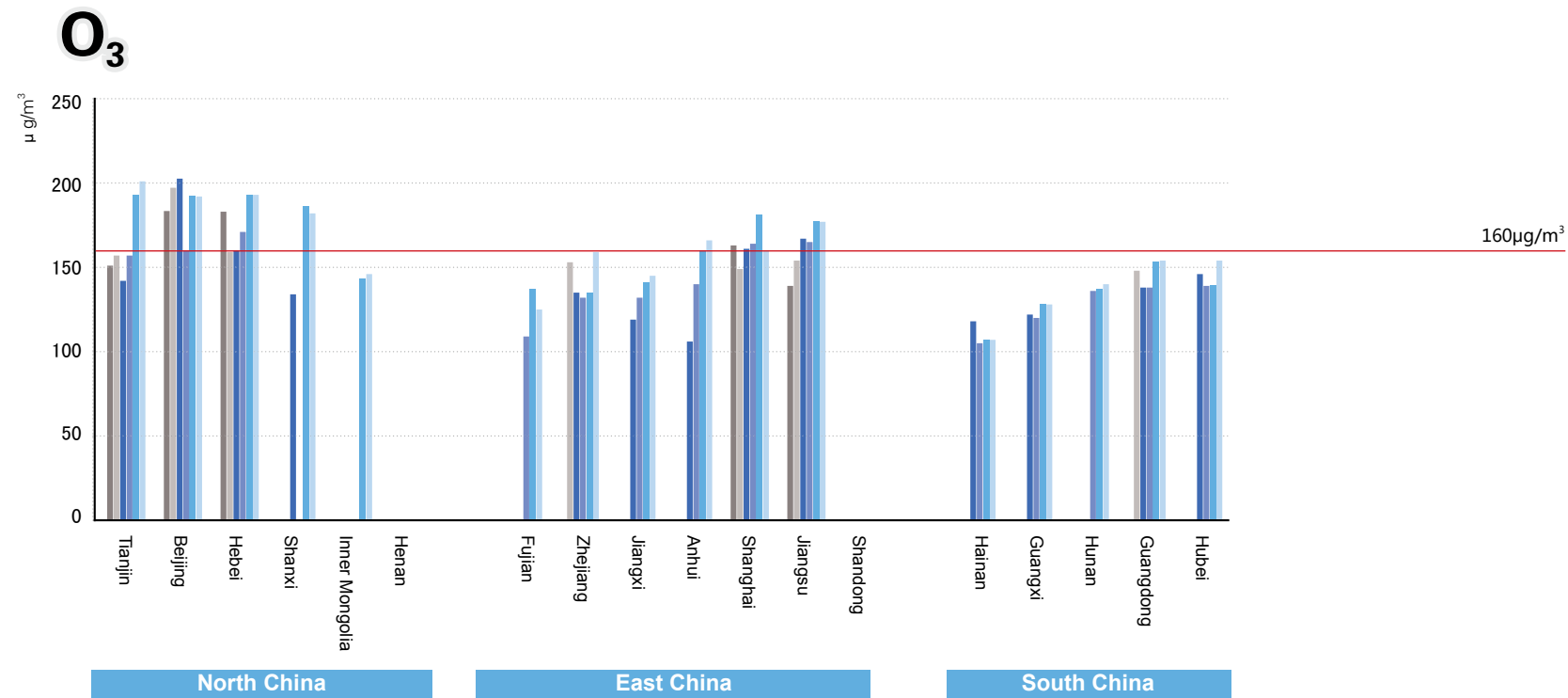


Figure 14 2013-2018 Annual Mean Concentration of O₃ by Province

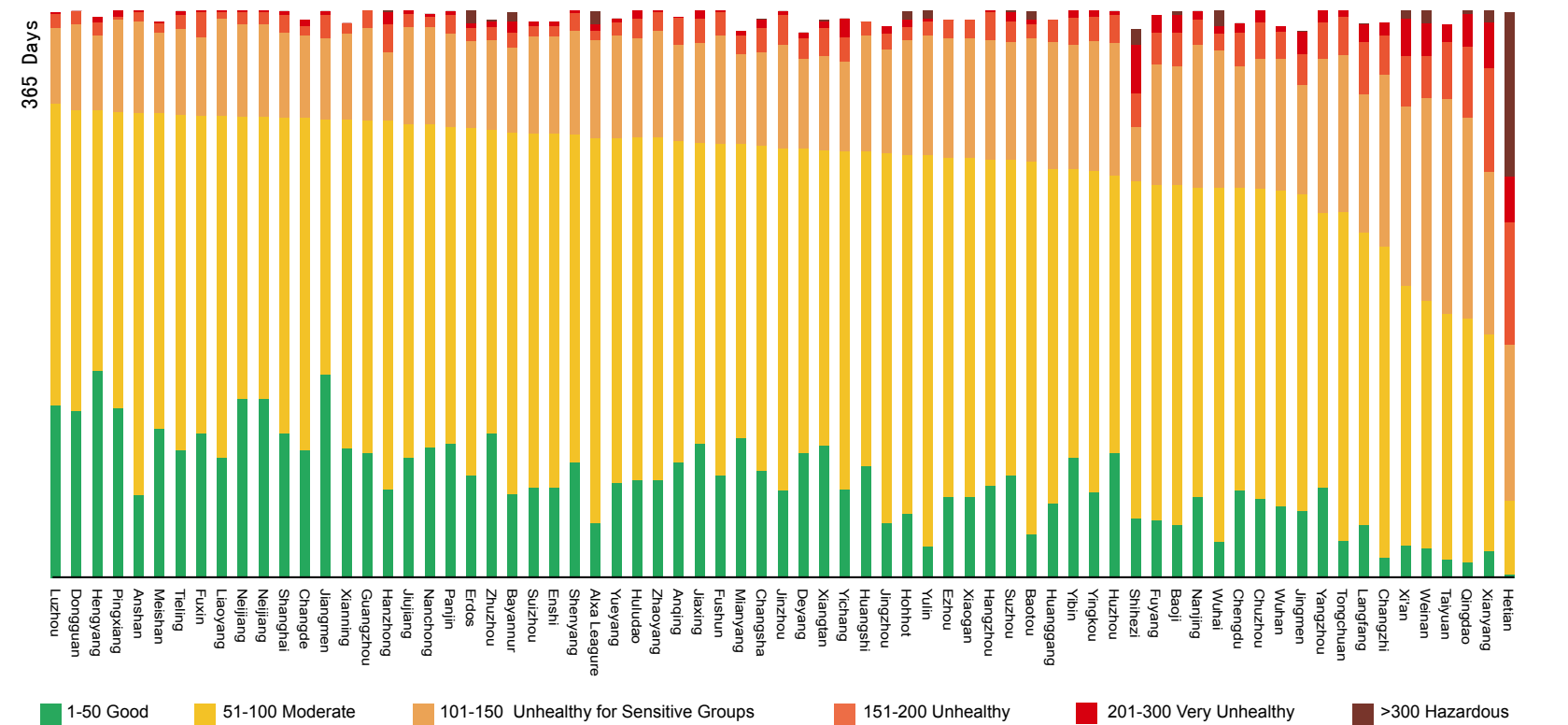
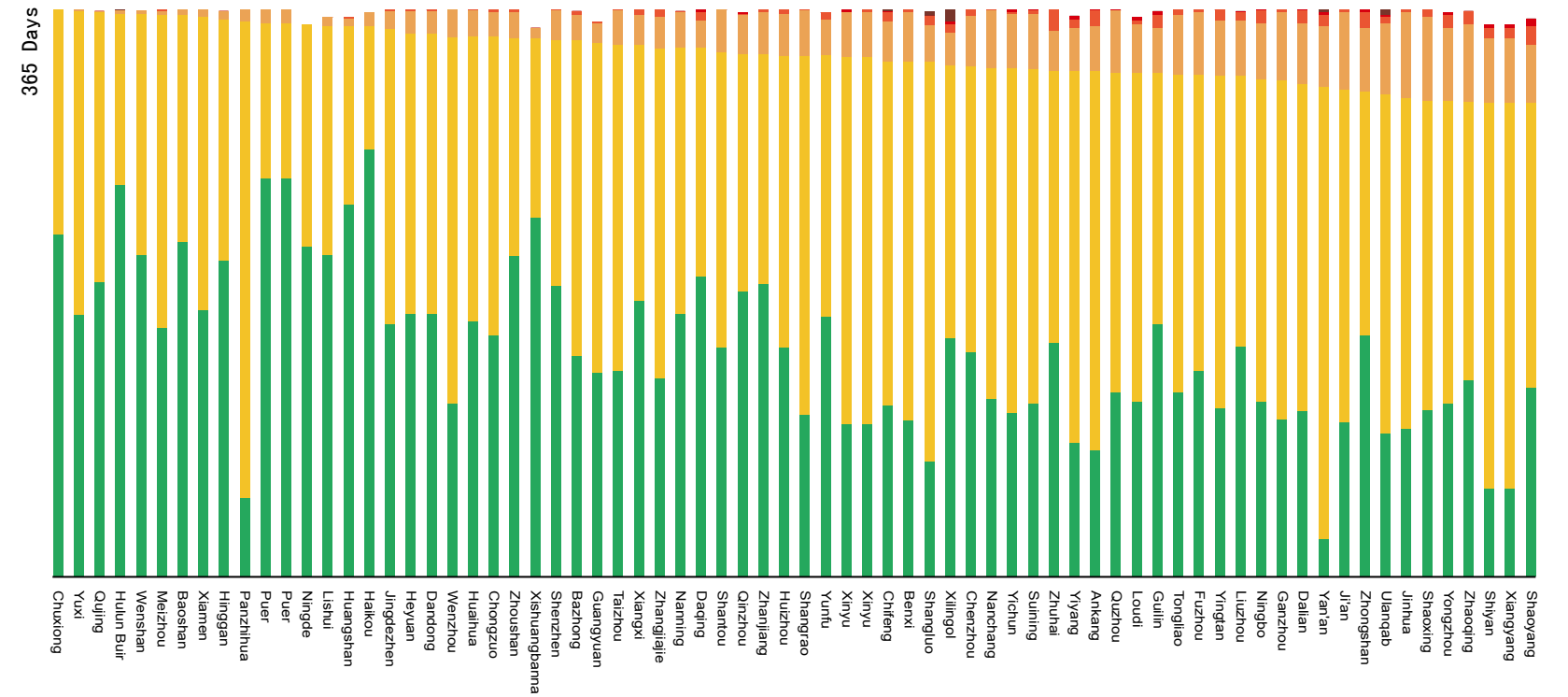


Figure 15 Distribution of AQI for Some Cities in 2018

Overall, air quality in cities across the country demonstrated the following features in 2018:

Air quality generally improved, but O₃ pollution continues to worsen

Generally speaking, 2018 saw air quality in Chinese cities keep up the momentum of improvement from 2017. The 338 cities' overall annual average percentage of attainment days was 79.3%, and a total of 121 cities complied with air quality standards, up by 22 cities year on year. With regards to the annual average concentration of pollutants, PM_{2.5}, PM₁₀, SO₂, NO₂ and CO all kept falling, while SO₂ complied with the standard in all 338 cities, and CO in 337 cities. O₃ pollution continued to increase, with the annual average concentration rising slightly yet at a slower rate - down from an 8% increase in 2017 to only 1.3% in 2018. The number of non-attainment cities of PM_{2.5}, PM₁₀, SO₂, NO₂ and CO dropped steadily, while the number of O₃ non-attainment cities continued to rise (Figure 16-17).

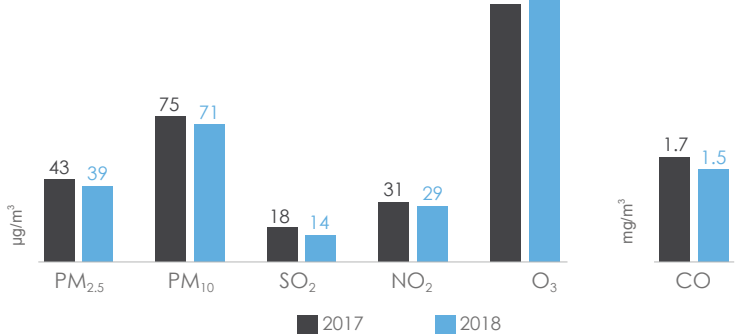


Figure 16 Annual Average Concentrations for Six Criteria Pollutants of 338 cities in 2017 and 2018

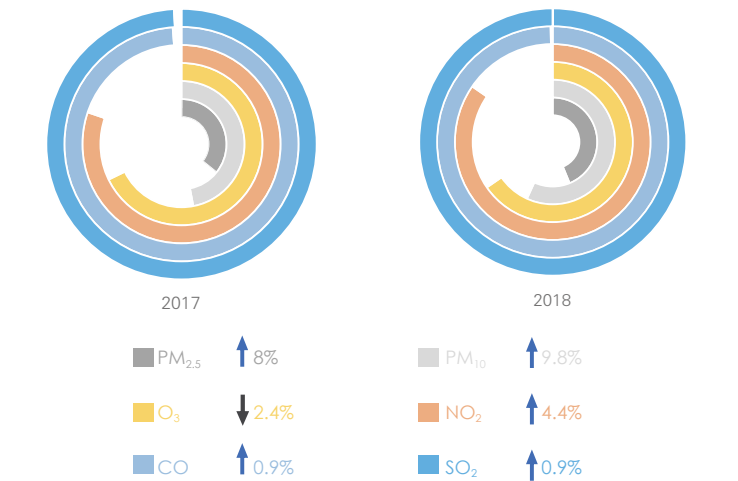


Figure 17 Percentage of Attainment Cities for Six Criteria Pollutants in 2017 and 2018

Among 169 key cities, most saw the annual mean concentration of PM_{2.5} fall, but over 20 cities failed to meet the annual target

Among 169 key cities, a total of 149 cities saw the annual mean concentration of PM_{2.5} drop by 0.8%-32.8% year on year, with 75 cities ranging from 10% to 20%, and 16 cities exceeding 20%. Harbin showed the largest improvement (Figure 18). Datong, Sanmenxia, Wuhu, Guangzhou, Weinan and Guiyang recorded figures level with those of 2017.

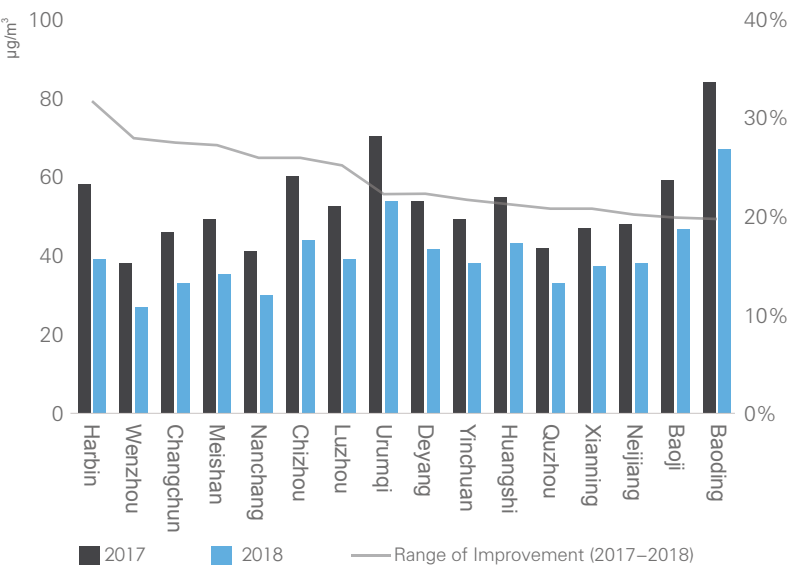


Figure 18 Cities with a Significant Decrease in PM_{2.5} Annual Mean Concentration in 2018

14 cities experienced a rise in annual mean concentration, up by 1.7%-15.4%. Specifically, Jingmen and Xining saw increases above 10% (Figure 19). Another 9 cities actually recorded small improvements, yet still failed to realize the annual target.

Among 169 key cities, over 60 cities saw no increase in attainment days, and the cities of Henan Province worsened considerably

Among 169 key cities, the number of attainment days for 59 cities was fewer than in 2017. A total of 14 cities saw total attainment days fall by more than 20 days, and Xinyang, a city of conspicuously poor performance in this regard, saw a decrease of 53 days (Figure 20). Baoding, Shijiazhuang, Dongguan, Guangzhou, Jingzhou and Huangshi saw their numbers equal to 2017. Cities in Henan Province demonstrated poor performance overall, and 14 of 17 cities under its

administration experienced a year-on-year decline in attainment days, 9 of which stood among the top 10 cities with the largest drops in attainment days, drops that ranged from 24 to 53 (Figure 20).

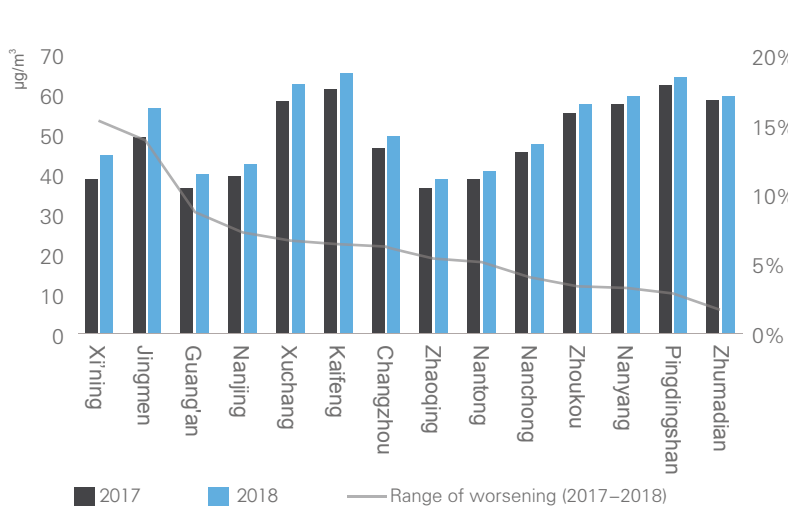


Figure 19 Cities with a Significant Increase in PM_{2.5} Annual Mean Concentration in 2018

Another 104 cities recorded more attainment days than in 2017, with the numbers ranging from 1 to 46 days. Altogether 28 cities experienced more than a 20-day increase, and Changchun was the city with the largest

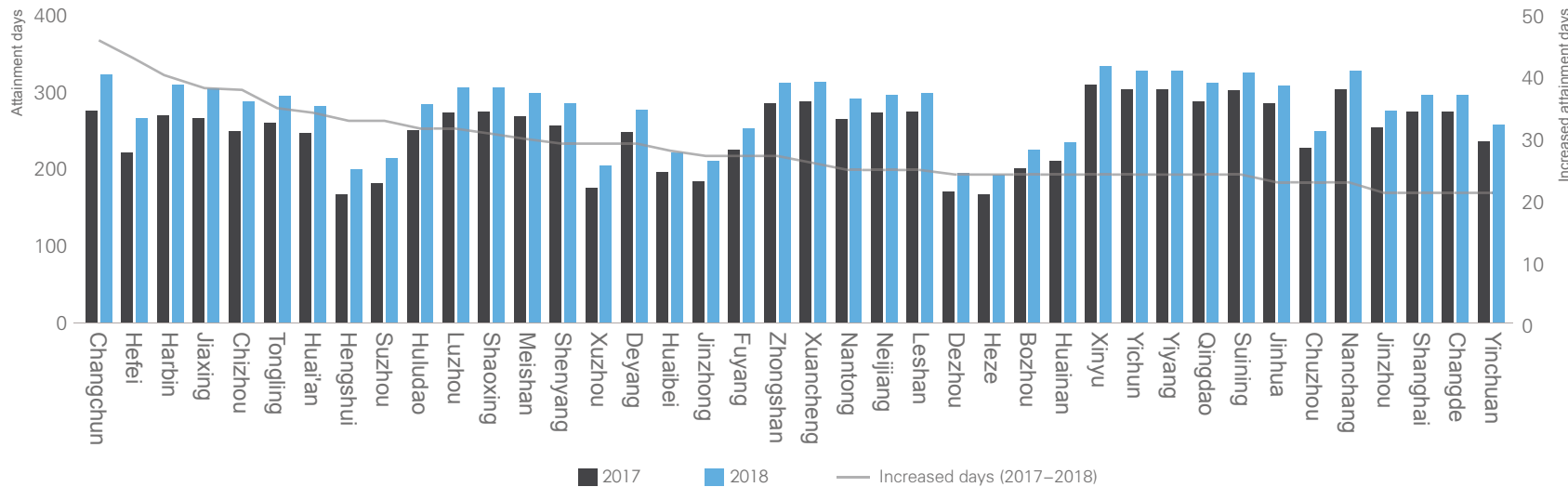


Figure 21 Cities with a Significant Increase in Attainment Days in 2018

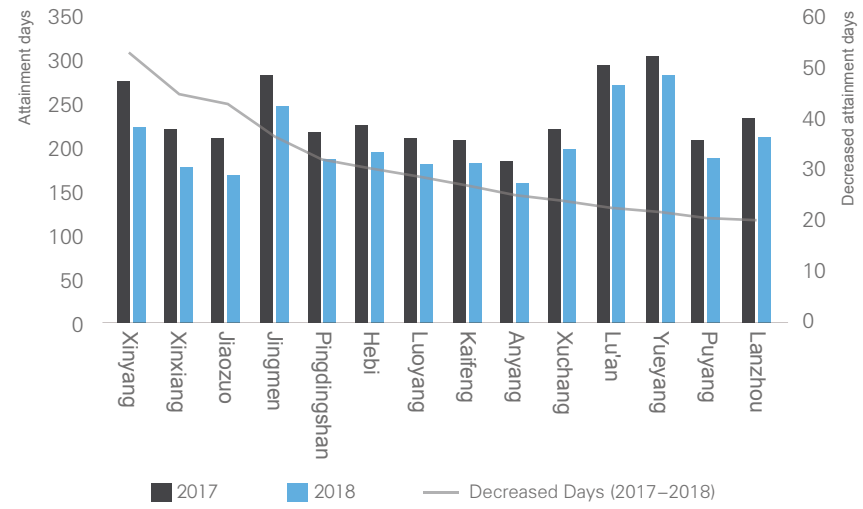


Figure 20 Cities with a Significant Decrease in Attainment Days in 2018

increase in attainment days: 46 days (Figure 21). Changchun, Harbin, Chizhou, Luzhou, and other cities with top improvement in attainment days were also ranked among the top in terms of PM_{2.5} reduction.

Chapter II.

Policies and Implementation Progress

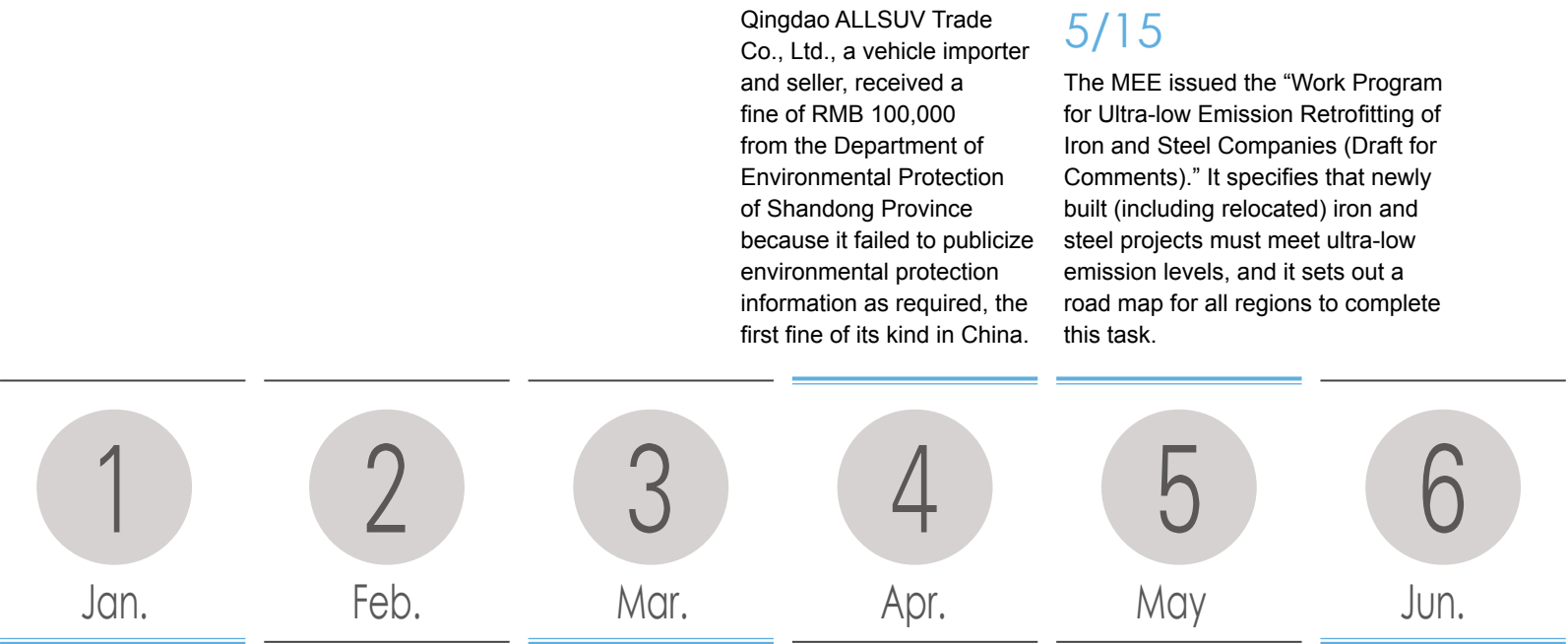


2018 was a milestone year in the history of air pollution prevention and control in China. Based on the successful implementation of the Ten Articles, China opened a new chapter in the form of the Three-Year Action Plan, launching the 2.0 Era of clean air action.

From 2013 to 2017, cities witnessed a general improvement in air quality, but the overall picture for air pollution prevention and control remained grim, with more than sixty percent of the 338 cities exceeding air quality standards. Yet the Blue Sky Defense Battle faces still greater challenges, following the implementation of a host of key emission reduction projects and programs the potential for further emission reductions is shrinking, and control becomes ever more difficult.

Policy implementation of air pollution prevention and control expanded, deepened and became more precise in 2018. Given the state of air quality, the severely-polluted Fen-wei Plains was added as a key region; emission reductions were realized by optimizing the structure of industry, energy, transportation and land use; precise measures were taken based on scientific research and analysis; and the concepts of "city-specific strategy" and "factory-specific strategy" were adopted for highly-polluted regions and major emission sources to realize refined treatment.

Major Events of Air Pollution Prevention and Control in 2018



1/9 Shandong KAMA Automobile Company and Shandong Tangjun Ouling Automobile Manufacture Co., Ltd. received fines of more than RMB 30 million because they produced vehicles with excessive emissions and tampered with pollution control devices. This marked the first case in which the former Ministry of Environmental Protection (MEP) penalized vehicle manufacturers.

1/10 The former MEP issued the "Pollutant Discharge Permit Regulation (For Trial Implementation)", marking the beginning of explorations into the establishment of a permit management regime in iron and steel and other key industries.

3/13 The MEE was established amid institutional reform, and the Department of Atmospheric Environment took up the responsibilities of the Atmospheric Environment Administration for the BTH Region and Surrounding Areas. Beyond that, the responsibility for climate change under the National Development and Reform Commission (NDRC) was transferred to the Department of Climate Change newly set up under the MEE.

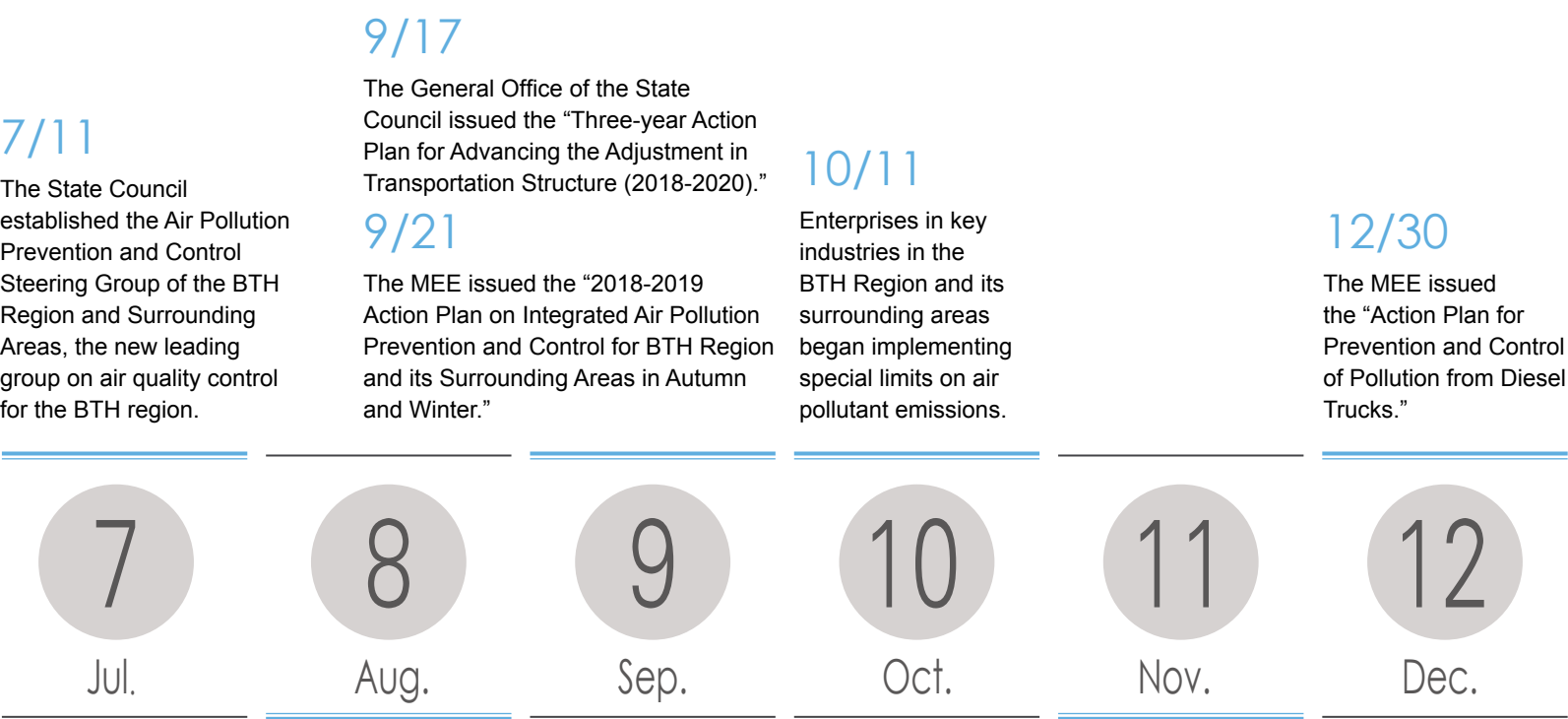
3/28 A falsification scandal of automatic monitoring of air quality was exposed in Linfen of Shanxi Province. Those people involved were severely punished.

6/5 The MEE issued the China Air Quality Improvement Report (2013-2018) on World Environment Day, making a global announcement about its achievements in air pollution prevention and control over the previous six years.

6/18 The State Council officially issued the "Three-Year Action Plan for Winning the Blue Sky Defense Battle" ("Three-Year Action Plan"). The Fen-wei Plains were added as a key region for air pollution prevention and control, and control efforts were signaled to go deeper, targeting structural reforms.

6/22 The MEE and the State Administration for Market Regulation (SAMR) jointly issued the "Limits and Measurement Methods for Emissions From Diesel Fueled Heavy-duty Vehicles (China VI) (GB 17691-2018)," adding a requirement of real-road emission tests for full vehicles for the first time. The standard has been officially implemented as of July 1, 2019.

Figure 22 Major Events of Air Pollution Prevention and Control in 2018



8/5 The Ministry of Industry and Information Technology (MIIT) and the NDRC jointly prohibited cement and plate glass industries from increasing production capacity, in order to lessen any excess capacity.

8/19 The National Energy Administration (NEA) issued a letter on the ultra-low emission retrofitting and energy conservation retrofitting of coal power, requiring Central China to complete the retrofitting in 2018.

11/7 The MEE and the SAMR jointly issued:
◆ "Limits and Measurement Methods for Emissions from Diesel Vehicles under Free Acceleration and Lugdown Cycle GB3847-2018", constricting the limits for smoke-intense emissions from in-use diesel vehicles in annual inspections and adding nitric oxide testing and vehicle OBD inspection.
◆ "Limits and Measurement Methods for Emissions from Gasoline Vehicles under Two-speed Idle Conditions and Short Driving Mode Conditions GB 18285-2018", constricting the emission standard for in-use gasoline vehicles.
◆ "Limits and Measurement Methods for Exhaust Smoke from Non-road Mobile Machinery Equipped with Diesel Engine (GB 36886-2018)", introducing limits on emissions from in-use non-road mobile diesel engines for the first time.

11/2 The YRD Region issued its "2018-2019 Action Plan on Integrated Air Pollution Prevention and Control for YRD Region in Autumn and Winter."

11/16 Work began on ultra-low emissions retrofitting for coal-fired boilers with a capacity above 65t/h.

11/30 The Ministry of Transport issued the "Plan for Implementation of the Emission Control Areas for Air Pollution from Vessels," expanding and upgrading the original vessel emission control areas.

Scientific Capacity Building

Local monitoring networks and VOCs monitoring systems continued to expand

After the national ambient air quality monitoring network was established across the country, construction of province-level and city-level monitoring stations intensified, which together with an increase in the number of stations at city/district levels and county/township levels has helped realize a data network. In 2018, Hebei Province completed the construction of air quality monitoring stations in 1,985 townships, 218 development zones at the provincial level or above, and five ports. This achieved full coverage of air quality monitoring across the province. Henan Province completed the construction of 262 province-control air quality automatic monitoring stations and 1,804 township-level automatic air quality monitoring stations. 120 county-level stations in Jiangxi Province were all handed over to the provincial level for operation management. Xinjiang completed its transition into monitoring with the addition of 38 state-controlled automatic air quality monitoring stations and 80 region-controlled automatic air quality monitoring stations, along with a direct connection between regional and ministerial data. Shaanxi Province established a monitoring network made up of 172 automatic air quality monitoring stations of all types, including 50 state-controlled stations, 111 province-controlled stations, three background stations, two quality control stations, three regional stations, two laser radar and online air pollution source apportionment stations and one rural station. Qinghai Province built five new province-controlled automatic ambient air quality monitoring stations, adding to the total number of 57 province-controlled stations. Guizhou constructed 94 province-controlled ambient air quality automatic monitoring stations and achieved full coverage of cities at the prefecture level and above.

The monitoring system for refined treatment of VOCs also expanded without pause. China conducted manual VOCs monitoring in 78 cities in the key regions, including the BTH Region and its surrounding areas, the YRD, the PRD and the Chengdu-Chongqing Region, in order to understand the spatial and temporal distribution of VOCs across the country. Additionally, Guangdong Province developed VOCs monitoring and an online monitoring platform for the ambient air quality monitoring network in the Guangdong, Hong Kong, Macau and PRD region, and built up fundamental capacity in monitoring VOCs for the ambient air quality monitoring network in the northeast and northwest parts of Guangdong

Province. Fujian Province built six new automatic monitoring stations for VOCs in ambient air. Number of newly-established ambient air quality monitoring stations of some cities in 2018 is shown in Figure 23.

Research teams facilitated precise air pollution control with "city-specific strategies"

In 2018, in accordance with the key program of ascertaining cause and control of heavy air pollution, the National Joint Research Center for Tackling Key Problems in Air Pollution Control (Joint Research Center) supported precise policy implementations based on scientific research in the "2+26" cities, Fen-wei Plains and Xiong'an New Area. The research team developed the emissions inventory for "2+26" cities by adopting unified methods and standards; established a precise source apportionment system based on source spectrums, emissions inventory, air quality simulations and receptor models; and put in place a "full-process" response system covering heavy pollution forecasting, consultation and analysis, early warning and emergency response, follow-up and assessment, and expert interpretation.

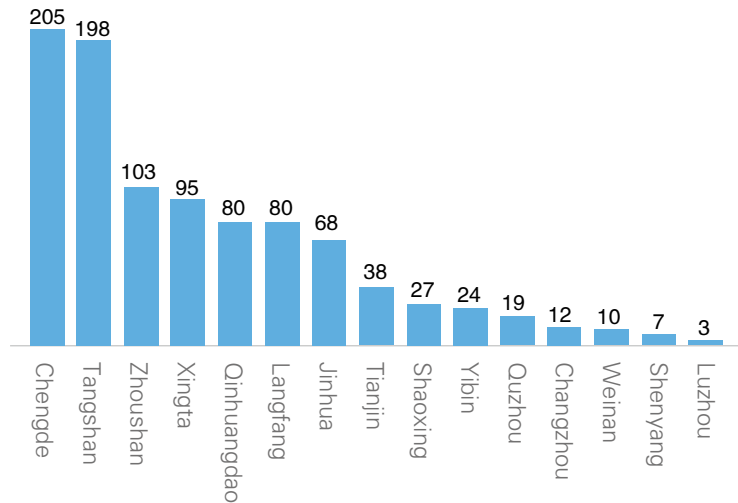


Figure 23 Number of Newly-Established Ambient Air Quality Monitoring Stations of Some Cities in 2018

Regarding the formulation of policies and measures, the research team proposed an air quality attainment timetable and improvement roadmap for the "2+26" cities and cited stronger control measures for key emission sources and key pollutants in non-power industries. Furthermore, the research team continued the practice of entering sites and conducting follow-up research on "city-specific strategies," and devised comprehensive "city-specific strategy" solutions on the basis of emissions inventory and source apportionment results.

The results released by the research team indicated that major pollution sources of PM_{2.5} in cities of the BTH Region and its surrounding areas included industries, vehicles, coal and fugitive dust, among which raw coal burning accounted for a major part of coal's share. It should be emphasized that regional transmission of PM_{2.5} and its precursors intensified the autumn and winter pollution levels in "2+26" cities, contributing about 20%-30% of the yearly average, while regional transmission during heavy pollution periods added another 15%-20%. As control on industrial pollution and coal pollution tightened, the contribution of those two factors began to decline, while that of vehicles rose. This trend became marked in megacities like Beijing. The results of PM_{2.5} source apportionment released by Beijing and Jinan in 2018 verified this trend.

Beijing -- Regional transmission contributed about one third of PM_{2.5} emissions in Beijing and, as air pollution worsened, the contribution of regional transmission rose, accounting for 55%-75% on heavy pollution days.

Jinan -- Regional transmission contributed about 26%-34% to PM_{2.5} emissions in Jinan.

Regarding the local contributions, source apportionment results in Beijing and Jinan are shown in Figure 24.

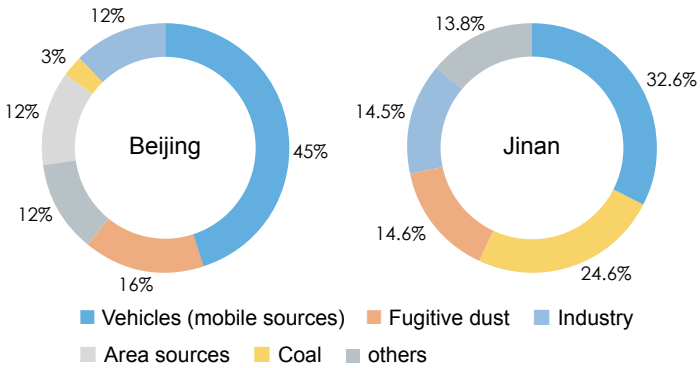


Figure 24 Source Apportionment Results of Beijing and Ji'nan in 2018

Based on its experience in providing scientific support in different cities, the Joint Research Center compiled and updated the Workbook for Follow-up Study on Air Pollution Prevention and Control (Version 3.0) and the Technical Guidelines for Formulating Integrated Plan for Air Pollution Prevention and Control (Version 2.0), and in doing so made urban follow-up research more normative, scientific and accurate.

The practice of having research teams stationed in cities to conduct follow-up studies, along with customized comprehensive plans for air pollution prevention and control based on respective features of cities and unified standards and requirements, can help cities (especially those with poor scientific research capacity) realize precise policy implementation and improve air quality. But, conversely, this practice needs to be further improved, especially with regards to the cultivation of local talent and team building, as well as the establishment of long-term mechanisms after the key program ends, so that timely and sustainable scientific support can be provided in the future.

Leadership for collaborative air pollution prevention and control in the BTH Region was upgraded, and the Fen-wei Plains became a new key region

During the implementation of the Ten Articles, the BTH Region and its surrounding areas achieved substantial progress in regional collaboration on air pollution prevention and control, and under the strong promotion of the central government, the BTH Region and its surrounding areas broke through the impasse of uncoordinated action. In 2018, its regional collaboration mechanism was reinforced, with enhanced leadership. The General Office of the State Council established the Air Pollution Prevention and Control Steering Group of the BTH Region and Surrounding Areas, with Han Zheng, Vice Premier of the State Council, as leader, and the MEE and administrative leaders of the BTH Region as deputy chiefs. The Steering Group facilitated regional coordination based on the working conference system and information submission system.

Furthermore, the MEE was established amid institutional reform, the Department of Atmospheric Environment took up the responsibilities of the Atmospheric Environment Administration of the BTH Region and Surrounding Areas, and five relevant divisions dealt with the daily work of the Steering Group.

The "2018-2019 Action Plan on Integrated Air Pollution Prevention and Control for BTH Region and its Surrounding Areas in Autumn and Winter" focuses on strict control of "high-pollution and high-emission" industries

and the control of "scattered, unregulated and high-pollution" enterprises. But it also warns against a "one size fits all" approach and a lack of administrative diligence, and requires the practice of differentiated peak shifting production.

In 2018, the Fen-wei Plains established a collaboration mechanism for air pollution prevention and control, and the first regional collaboration meeting was held in Xi'an in September, which deliberated on, and adopted, the "2018-2019 Action Plan on Integrated Air Pollution Prevention and Control for Fen-wei Plains in Autumn and Winter." In addition, the Fen-wei Plains started building up its capacity in air pollution prevention and control, establishing the Northwest China Regional Air Quality Forecast Center, organizing expert teams, and since October has officially started forecasting regional air quality. The Fen-wei Plains unified the standard for regional emergency response and alerts, and integrated regional coordination on emergency response measures into the emergency response plan of cities.

The YRD improved its collaboration mechanism for air pollution prevention and control. It formulated a three-year plan for regional air quality improvement and in-depth control (2017-2020), and a 2018 action plan on air pollution prevention and control for autumn and winter. It strengthened early warning systems and coordinated action on heavy pollution days in the YRD, so that the initiation standard for such systems and response intensity in the region can be unified.

The YRD also gradually adjusted and unified its regular pollution control measures, and used practices such as mutually recognized standards to judge environmental irregularities and broken promises, and joint incentives and punishments, among other measures, to "crowd-out" high-emission enterprises and avoid regional pollution diversion.

Noticeably, even in the BTH Region and its surrounding areas where an in-depth regional collaboration mechanism has already been established, mechanisms for regional collaboration on air pollution prevention and control are still being promoted and facilitated with the strong support of the central government. There is currently no mechanism for balancing regional interests, and no mechanism for considering regional emission accountability based on the degree of local air pollution, the ability to cope economically, and local environmental management levels, among other elements. This means that, even if a region has a strong scientific grounding and is able to identify an inventory of the most effective emission reduction measures, it will not be able to develop the most cost-effective holistic emission reduction strategy. The absence of an interest coordination and compensation system has meant some cities that do not necessarily rank low in air quality improvement have nonetheless lacked a strong willingness and effort to improve air quality.

Control of Major Pollution Sources

Pollution control of stationary sources

China's energy structure is characterized by coal dominance, with a low level of clean utilization, extensive structural pollution, and a high intensity of coal consumption in key areas. Reducing total coal consumption is an important measure to control coal pollution and also forms the crux of controlling pollution from stationary sources. Therefore, the Three-Year Action Plan continues to regard speeding up adjustments to the energy structure as an important measure. It promotes the development of non-fossil energy and the clean and efficient utilization of fossil energy, sets up targets for total coal consumption at the national level, and defines major reduction measures.

In 2018, total energy consumption registered 4.64 billion tce in China, up 3.3% from that of 2017. Of that, coal consumption was 2.737 billion tce, up by 1.0% year on year and accounting for 59.0% of total energy consumption (down 1.4% year on year). This result realized the target of "reducing the share of coal consumption to about 59%" as set out in the "Guiding Opinions on Energy Work in 2018" released by the NEA at the beginning of the year. The consumption of clean energy, such as natural gas, hydropower, nuclear power and wind power, accounted for 22.1% of total energy consumption, up 1.3% from that of 2017. The energy structure continued to be optimized (Figure 25), and this can be mainly attributed to the following actions.

Elimination of coal-fired boilers broadened

From 2013 to 2017, coal-fired boilers with a capacity under 10t/h were major targets of elimination. A total of over 200,000 boilers were phased out across the country, thus realizing the basic eradication of coal-fired boilers with a capacity under 10t/h. This outcome was not the end of controls on coal-fired boilers, however. In reality, the work was expanding. 2017 saw the elimination of coal-fired boilers with capacity under 35t/h in built-up areas of the "2+26" cities.

In 2018, coal-fired boilers with capacity under 35t/h were required by the Three-Year Action Plan to be eliminated across the whole country, not just in key areas, and to be prevented from being constructed in the future. Inventory reduction and incremental control led to the achievement of wide elimination of coal-fired boilers with a capacity under 35t/h. Hebei Province had taken the lead by eliminating a total of 6,684 coal-fired boilers with capacity under 35t/h in 2018, with a total capacity of 13,571 t/h. Some cities of Jiangsu, Guangdong, He'nan, and Anhui took the twin actions of elimination and clean energy transformation.

In the meantime, the remaining few (30,000) coal-fired boilers with capacity under 10t/h were eliminated across the country in 2018, showing giant strides were being taken towards complete elimination. Progress in eliminating coal-fired boilers in some cities is shown in Figure 26.

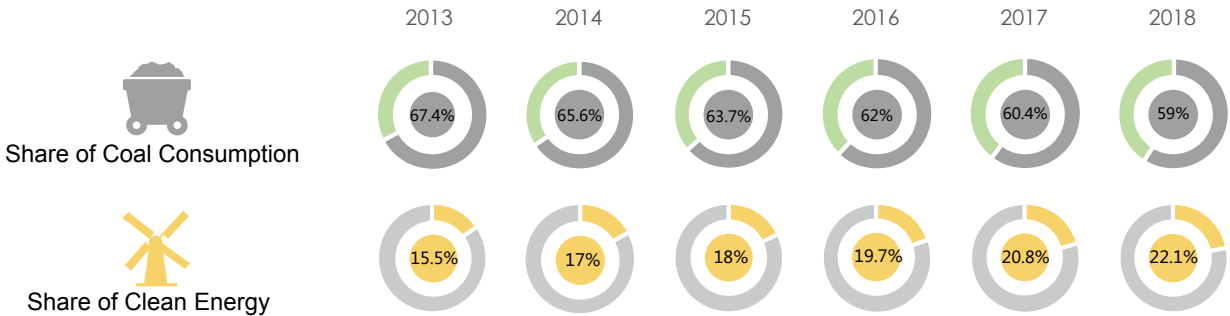


Figure 25 Optimization Process of China's Energy Consumption Structure

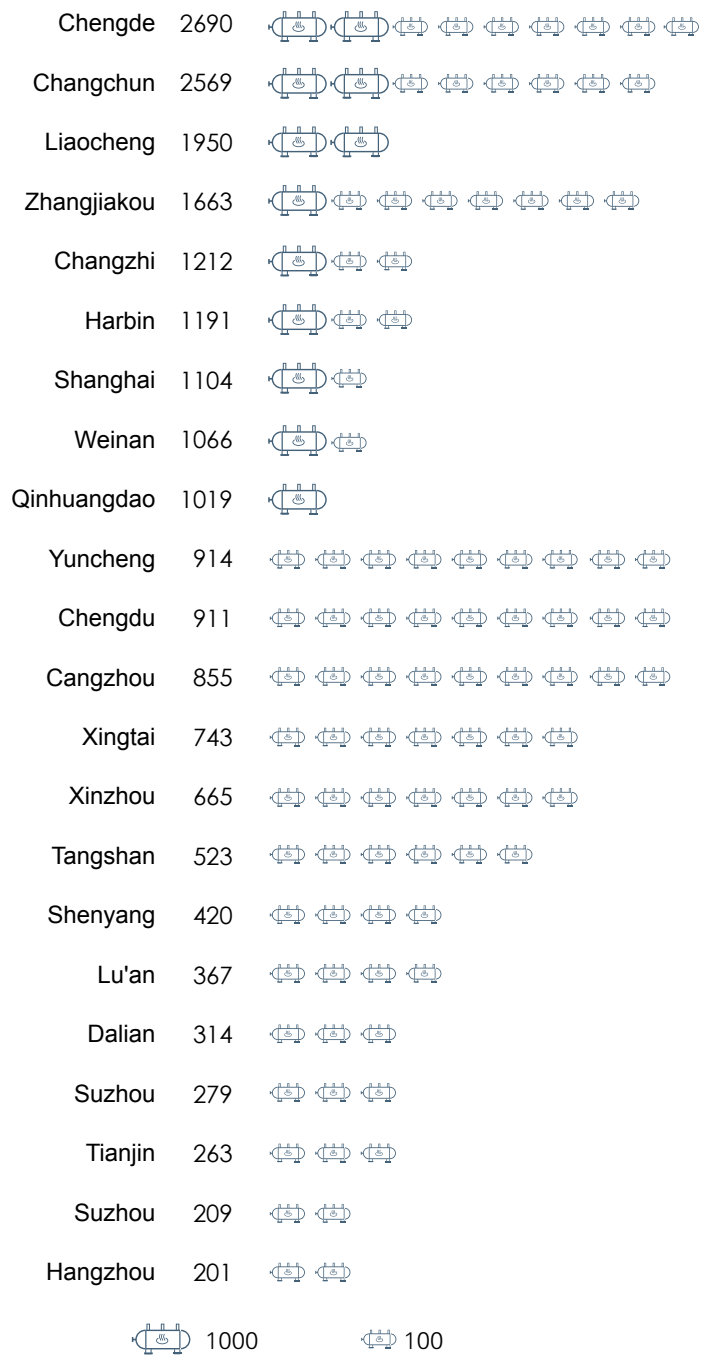


Figure 26 Number of Coal-fired Boilers Eliminated in Some Provinces and Cities in 2018

Initiated ultra-low emission retrofitting in non-power industries

China has been promoting ultra-low emission retrofitting in the thermal power industry since 2016. By the end of 2018, within a short span of three years, coal-fired generators meeting ultra-low emission limits had reached 810GW, accounting for 80% of total installed capacity of coal-fired plants. Levels of SO₂, NOx and smoke (dust) have dropped in consecutive years since 2016, and the contribution of ultra-low emissions in the thermal power industry should receive credit.

The energy and industrial sectors have long been the two major sources of air pollutant emissions in China and, as the ultra-low emission retrofitting of the thermal power industry approaches completion and its emission reduction potential has been almost fully explored, this has further highlighted the contribution of emissions from non-power sectors in industrial fields. The output of iron and steel, cement, plate glass and electrolytic aluminum in China still occupies the top position globally despite years of industrial restructuring. Compared with the power sector, looser emission standards and lower management capacity make the non-power sectors of these industrial fields promising for future pollution reductions. Upgrading the special emission limits of these industries to ultra-low emission standards could greatly release their emission reduction potential.

The Three-Year Action Plan clearly stipulates pushing forward with the ultra-low emission retrofitting of iron and steel and other industries, and the MEE thus issued the “Work Program for Ultra-low Emission Retrofitting of Iron and Steel Companies (Draft for Comments).” Hebei Province issued the “Ultra-low Emission Standard for Air Pollutants of Iron and Steel Industry (Draft for Comments)” and took the lead in China by advancing the ultra-low emission retrofitting of iron and steel and coking industries, with a total of 326 retrofitting projects finished throughout the year.

Resisted the "one size fits all" approach when renovating "small, scattered, unregulated and high-pollution" enterprises

Before 2018, "small, scattered, unregulated and high-pollution" enterprises were the focus of renovation due to their large number and high emissions, but elimination methods at the time mostly relied on a simple "one size fits all" approach. The definition of "small, scattered, unregulated and high-pollution enterprise" in some regions was also controversial, and doubts remained as to whether some enterprises should even be prohibited.

Various cities started to reclassify "small, scattered, unregulated and high-pollution" enterprises in 2018, and the adoption of "one size fits all" approaches were noticeably reduced. Based on the "factory-specific strategy" for renovation, an increasing number of enterprises were renovated or moved to industrial parks. Enterprises which lack proper approval, fail to conform with industrial policy and distribution planning, and which are not suitable for renovation should be eliminated. Enterprises with only poor environmental protection facilities that could reach stable attainment of goals through the upgrading and renovation of environmental protection equipment could restore production if renovations would be completed within a definite time limit; otherwise they should be shut down. As for enterprises which do not conform to site selection requirements or which use land illegally, they should follow scientific planning to undergo reorganization, integration and relocation to appropriate industrial parks.

Hebei Province investigated and renovated 16,918 "small, scattered, unregulated and high-pollution" enterprises, resulting in 10,879 being shut down and eliminated, 443 being integrated and relocated, and 5,596 being normalized and renovated.

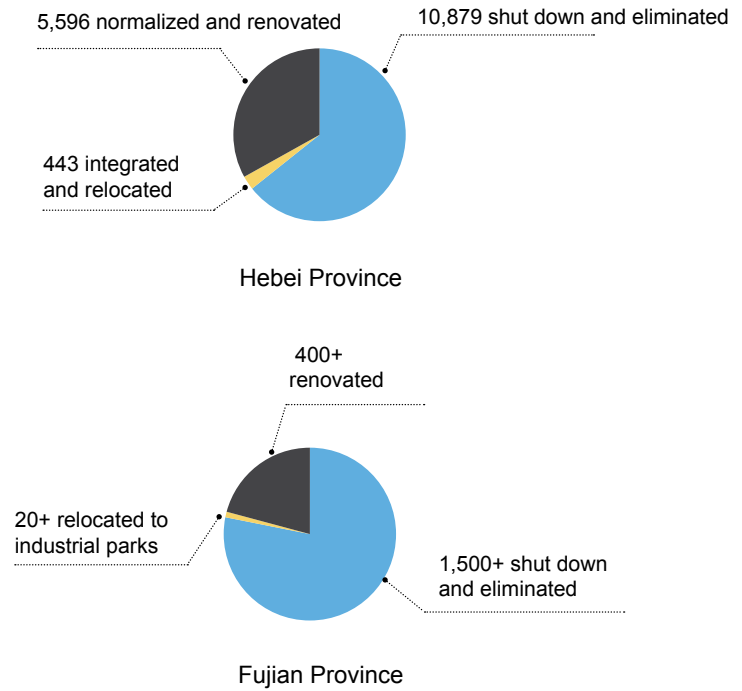


Figure 27 Numbers of "Small, Scattered, Unregulated and High-pollution" Enterprises Renovated in Hebei Province and Fujian Province in 2018

shut down and eliminated more than 1,500 enterprises, renovated over 400, and relocated more than 20 to industrial parks (Figure 27).

Pollution control of mobile sources

Mobile sources (including motor vehicles, non-road mobile machinery, ships, etc.) have become the primary or secondary sources of air pollution in many cities. The results from PM_{2.5} source apportionment in large and medium-sized cities show that mobile sources contributed 21.7%-45% of local air pollution. In megacities with more motor vehicles like Beijing, Shenzhen and Chengdu, the contribution exceeds 30%.

From 2013 to 2017, Chinese cities rapidly upgraded new vehicle emission standards and fuel standards, and the standards in key regions were as strict as those of cities in developed nations. Over the same period, a large number of yellow-label vehicles and outdated vehicles with higher emission factors were eliminated. Additionally, control measures for non-road mobile sources were gradually rolled out. At this stage, China's vehicle pollution prevention and control system was nearing perfection, and China achieved the striking result of total pollutant emissions down by 5% even as vehicle population rose by 33%.

However, there are still many unsolved difficulties in the prevention and control of pollution from mobile sources, including how to control the large number of in-use vehicles, how to tackle extensive diesel vehicle pollution, and how to systematically control non-road mobile sources. To that end, measures for the prevention and control of pollution from mobile sources have become more precise, and been extended and expanded after the launch of the 2.0 era of the Blue Sky Defense Battle. In 2018,China continued to promote that motor vehicles and non-road mobile machineries must comply with emission standards from the production stage to the in-use stage, and applied technical and information-based means to enhance supervision capability. On another front, China worked to further optimize the transportation structure. In 2018, this package of measures paid off and, even as vehicle population rose 3% from that of 2017, total pollutant emissions dropped by 7.2%, among which CO, HC, NOx and PM were down by 7.1%, 9.4%, 2% and 13.2% respectively.

Pushed new vehicles' true compliance with emission standards in the China VI Era

Important measures for reducing single vehicle emissions of internal combustion engine vehicles (ICEVs) at the source include elevating new

vehicle emission standards and ensuring that new vehicles designed and produced at scale by manufacturers comply with both the emission standard in the environmental information disclosure system and production conformity inspections.

China entered into the China VI Era for vehicle emission standards in 2018. The China VI emission standards for light-duty vehicles and heavy-duty diesel vehicles were released. Compared with China V standards, the emission limits of NOx and PM of China VI(b) for light-duty vehicles were tightened by 42% and 33% respectively, and those of heavy-duty vehicles 77% and 67% respectively. A limit for PM was also added, which will expedite vehicles to adopt more effective PM emission control technology. Shenzhen and Hainan implemented the China VI standards of light duty vehicles in October and November of 2018, ahead of schedule, and other key regions, the PRD Region, and the Chengdu-Chongqing Region will implement such standards in July 2019 ahead of schedule in accordance with the requirements of the Three-year Action Plan.

China tightened supervision on new vehicles in 2018 as it works to ensure that new vehicles produced and sold can truly comply with the emission standard. A total of 21,000 new vehicle models from 958 vehicle manufacturers across the country disclosed their environmental information, and 1,109 vehicle manufacturers submitted an assurance plan for environmental production conformity to the MEE. Regulators checked environmental information disclosure and production conformity of manufacturers, including sample checks of offline qualified products, on-site examination of emission control configuration and the extent of information disclosure.

In 2018, the Department of Ecology and Environment of Shandong Province imposed a fine of RMB 100,000 on Qingdao ALLSUV Trade Co., Ltd., a vehicle importer and seller which did not disclose its environmental information. The MEE imposed a fine of over RMB 38 million on Shandong KAMA Automobile Company and Shandong Tangjun Ouling Automobile Manufacture Co., Ltd., producers of vehicles with excessive emissions. By imposing severe punishment on non-conforming vehicle manufacturers, the authorities intended to deter the industry and ensure that new vehicles would actually comply with standards.

Fuel standards were upgraded, but inferior diesel products were still marketable

As vehicle emission standards become stricter, the upgrading of fuel standards is becoming more urgent. The Three-Year Action Plan makes

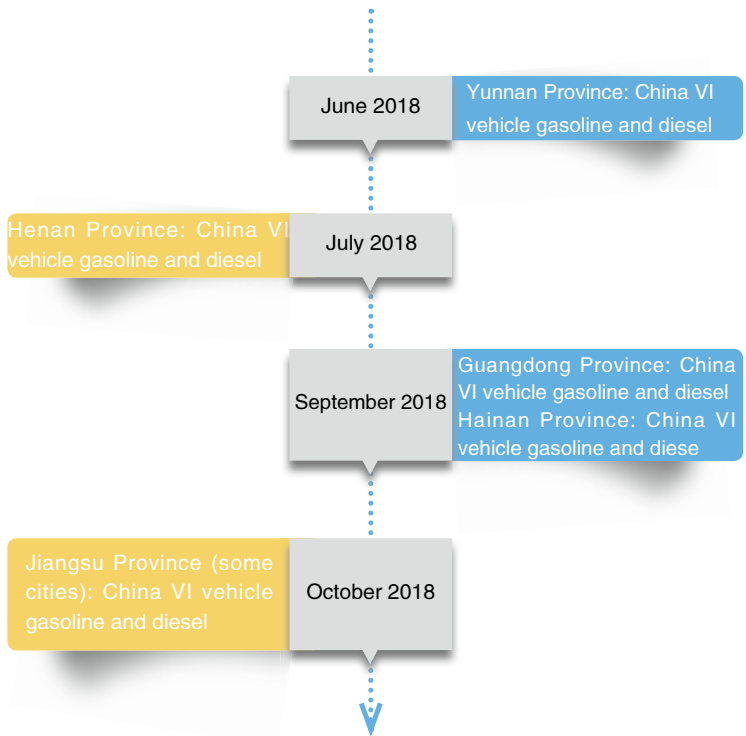


Figure 28 Provinces Supplying China VI Vehicle Gasoline and Diesel Ahead of Schedule in 2018

clear that, as of 2019, China will supply gasoline and diesel meeting China VI fuel standards across the board. Yunnan, Henan, Guangdong and Hainan Provinces, and some cities of Jiangsu Province took the first step in 2018 to supply China VI vehicle gasoline and diesel ahead of schedule (Figure 28). Compared with China V fuel standards, China VI vehicle gasoline has lower contents of alkene and aromatic hydrocarbon to reduce the tailpipe emissions of hydrocarbon, carbon dioxide and other pollutants, while China VI vehicle diesel has a lower content of polyaromatic hydrocarbon to reduce the tailpipe emissions of PM.

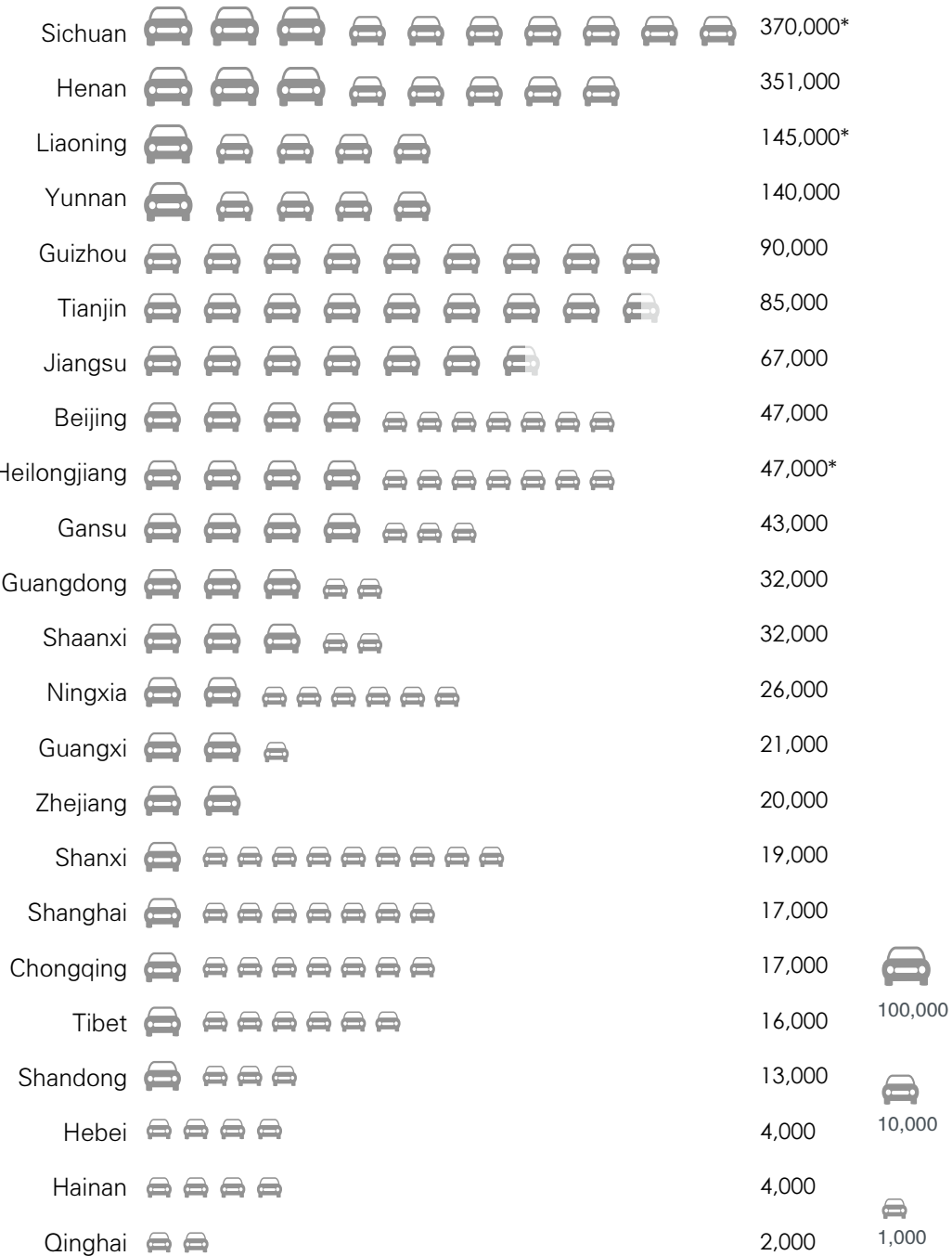
As fuel standards were upgraded, regulators also enhanced supervision of fuel products, and the results of sample checks showed that the quality of diesel fuel available on the market was less qualified than the ideal. In 2018, in sample checks on gas stations conducted by the MEE, the qualified rate of diesel samples in the BTH Region and its surrounding areas was 89.5%, while that of Shaanxi and the western area of Inner Mongolia was only 67.3%. This represents a huge gap from the target specified in the Action Plan for Prevention and Control of Pollution from Diesel Trucks, i.e., "the qualified rate of diesel fuel in sample checks should reach 95%, and the figure in key areas should exceed 98% in 2020".

Main efforts targeted in-use vehicle emission control, combining with a 'carrot and stick' approach

Although China's new vehicle emission standards have been as strict as those in developed countries, controlling new vehicles has only tackled part of the problem. Among the overall structure of the motor vehicle population, only 30.9% of vehicles and only 15.4% of diesel vehicles reach the emission standards of China V and above. It should be emphasized that the single vehicle emission level for outdated vehicles is much higher than that of new vehicles, and NOx and PM emissions from China III diesel vehicles accounted for more than half of total emissions of diesel vehicles, standing at 57% and 69% respectively. Therefore, controlling in-use vehicles, especially reducing the emissions of outdated vehicles, is critical.

Nationwide elimination of yellow-label vehicles came to an end in 2017. Starting from 2018, eliminating China III diesel trucks and outdated vehicles that had been converted from gasoline to natural gas has become the new priority. China phased out a total of over 2 million outdated vehicles. Henan Province alone eliminated 351,000 outdated vehicles, topping the list for eliminations. Major measures for eliminating outdated vehicles included economic compensation and traffic restriction. This can be seen as the simultaneous utilization of "carrots and sticks," which facilitated the rapid elimination of outdated vehicles.

To take Shenzhen as an example, China III diesel vehicles scrapped before the end of 2018 could gain a subsidy ranging from RMB 4,000 to RMB 95,000, but from 2019, the subsidy will be reduced by thousands



*Yellow-Label and Outdated Vehicles

Figure 29 Numbers of Outdated Vehicles Eliminated in Some Provinces in 2018

of yuan based on vehicle type and the method of elimination. In the meantime, about 129,000 China III diesel trucks with Shenzhen license plates followed traffic restrictions based on even- and odd-numbered license plates from 7:00 to 24:00 every day, and about 100,000 China III diesel trucks with license plates from other cities followed the traffic restrictions from 7 to 24:00 every day whether or not the license plate number was even or odd. Shenzhen eliminated 26,000 commercial outdated vehicles ahead of schedule in 2018. Elimination of outdated vehicles in some provinces in 2018 is shown in Figure 29.

Beyond that, identifying in-use vehicles with excessive emissions through regular emission inspection and random emission inspection, and then requiring those vehicles to undergo necessary maintenance, are important ways to reduce the emissions of in-use vehicles. However, issues widely existing in previous emission inspection systems, such as falsifications at inspection stations and vehicles flagged for excessive emissions passing second inspections despite not undergoing maintenance, have greatly reduced the effect regular inspection should have.

Since the Three-Year Action Plan was implemented, China has required all regions to improve their emission inspection and compulsory maintenance system (I/M system). One of the core points of the I/M system is the objectivity and professionalism of emission inspection institutions. Therefore, regulators in 2018 continued to enhance supervision on emission inspection institutions and punish institutional irregularities. The same year, departments of ecology and environment at all levels launched 27,601 examinations on these institutions, investigated 901 irregular institutions, and imposed RMB 52.992 million in penalties overall, with the average penalty 2.5 times that of 2017. The national vehicle emissions monitoring platform has covered a total of 6,113 vehicle emission inspection institutions, where regular inspection data of vehicles are integrated at the municipal, provincial and central level, up by 638 from that of 2017.

When it comes to random inspection, the country requires that, by 2020, 90% of the randomly inspected in-use diesel vehicles should comply with in-use vehicle emission limits, while the figure in key regions should reach 95%. As for the methods of random inspection, remote sensing monitoring has become a cutting-edge tool to root out high-emission vehicles.

In 2018, various cities installed 639 pieces of remote sensing monitoring equipment, more than twice that in 2017. Such equipment was used 270 million times to monitor vehicles' emissions, a sevenfold increase from 2017. The result was that they found 2.155 million instances in which a vehicle exceeded emission limits. Beyond that, China conducted 5.307

million roadside and on-site inspections, finding 561,000 occasions where a vehicle exceeded emission limits.

Using big data to deliver precise management of vehicles will also become an effective way to supervise vehicles with excessive emissions. The Three-Year Action Plan proposes establishing a nationwide information database for vehicles with excessive emissions to realize full-chain management, i.e., tracing production and importer enterprises, place of registration, emission inspection institutions, maintenance entity and transportation enterprise of vehicles with excessive emissions. To take Beijing as an example, in 2018 Beijing established a database of vehicles with excessive emissions, and information of such vehicles that were identified through law enforcement inspection was entered into the database. Any vehicles with excessive emissions which had a license plate from other cities were not allowed to apply for a permit to enter Beijing until they qualified during a reinspection.

Targeted high-emission diesel vehicles and used structural adjustment to reduce emissions

In China, the long-term dependence on diesel trucks in the road freight industry has led to an unoptimized freight transportation structure. This is one of the reasons behind the high contribution of diesel vehicle emissions. On the basis of upgrading existing measures such as vehicle standards and fuel standards, vehicle pollution control in 2018 focused more on structural adjustment, regarding it as an important policy to address diesel vehicle pollution. It optimized freightage structure by reducing the proportional use of diesel vehicles through the use of road-to-railway and road-to-waterway transport.

In 2018, the freight volume of railway and waterway registered increases of 9.1% and 5.2% from that of 2017 respectively, already fulfilling 84% and 98% of the targets for 2020 (Figure 30). The increase in railway freight mainly came from the rise in freight of coal, ore and other bulk cargo and containers, up by 12% from that of 2017. Xinjiang Uygur

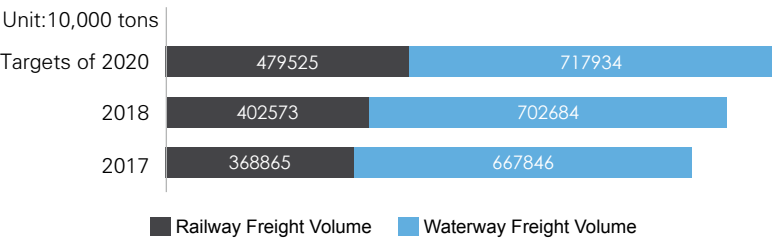


Figure 30 Nationwide Railway and Waterway Freight Volume in 2017 and 2018

Autonomous Region and Tibet Autonomous Region saw railway freight increase by more than 20%. The increase in waterway freight can be mainly found in Shanghai, Zhejiang Province and Fujian Province, with the growth rate higher than 10%.

Despite the increase in railway and waterway freight volume, adjustments to freight transportation structure did not produce a palpable effect. In 2018, the share of road, railway and waterway in freightage was 76.8%, 7.8% and 13.6% respectively, and the share of railway in freightage rose for two consecutive years following 2016, but that of water freightage kept falling, and the share of road transportation continued to rise (Figure 31).

The following Figure 32 explains the changes in the nationwide transportation structure. As is evident, except for a road freight decline in Tianjin, Heilongjiang Province and Shanghai, other provinces recorded ever-growing road freight, and road transportation still dominated long-distance freight transport.

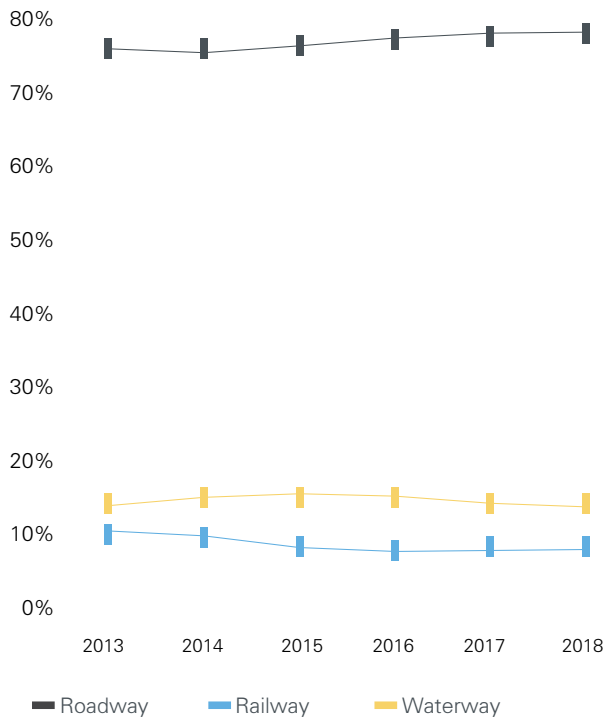


Figure 31 Share of Road, Railway and Waterway Freight Volume in Transportation Structure in 2013-2018

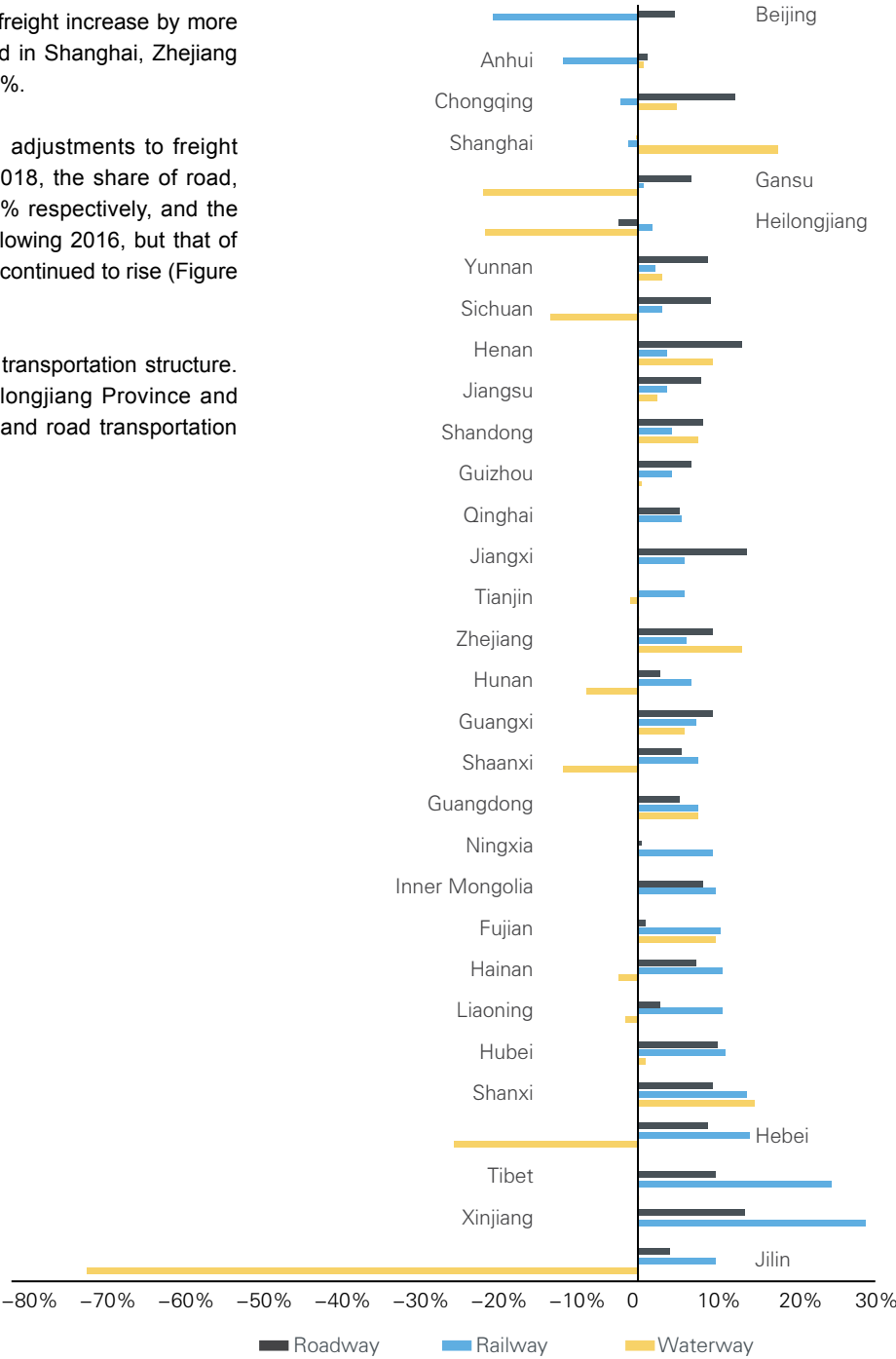


Figure 32 Changes of Waterway, Railway and Road Transport Volumes in Provinces, Municipalities and Autonomous Regions in 2018 Compared with 2017

New energy vehicles were promoted at pace, with megacities as the major fronts

Promoting new energy vehicles (NEVs) is a significant step in preventing and controlling pollution from mobile sources, as specified in the Three-

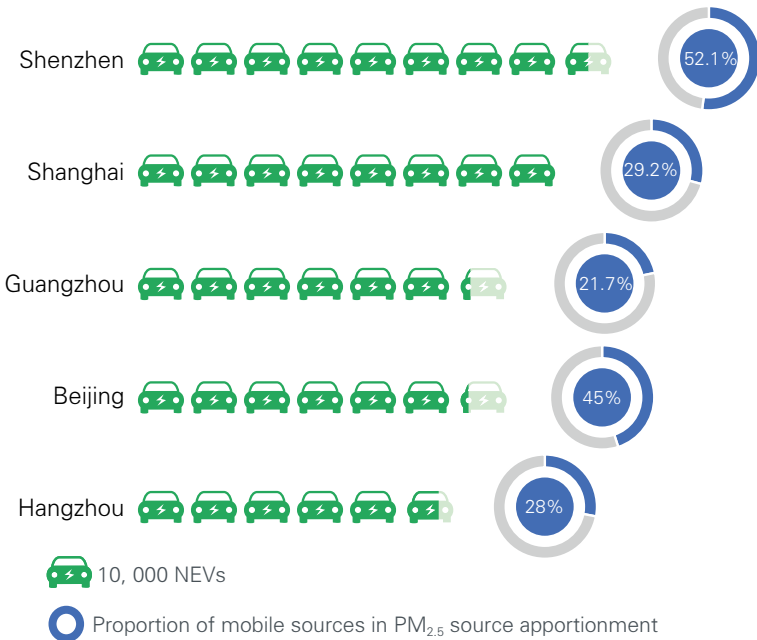


Figure 33 Top Five Cities in Sales Volume of NEVs in 2018 and Contribution of Mobile Sources to PM_{2.5} Source Apportionment

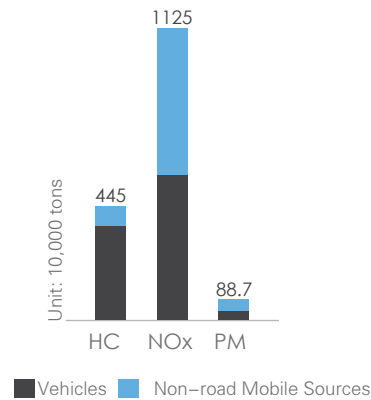


Figure 34 Pollutants Emissions from Mobile Sources in 2018

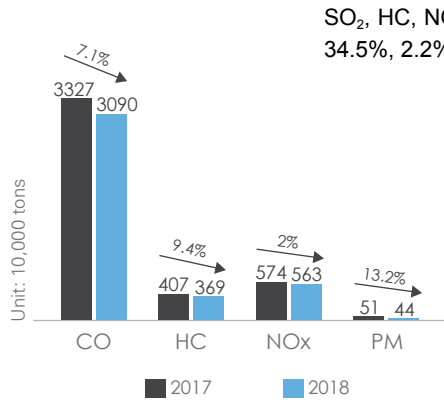


Figure 35 Pollutants Emissions from Vehicles in 2017 and 2018

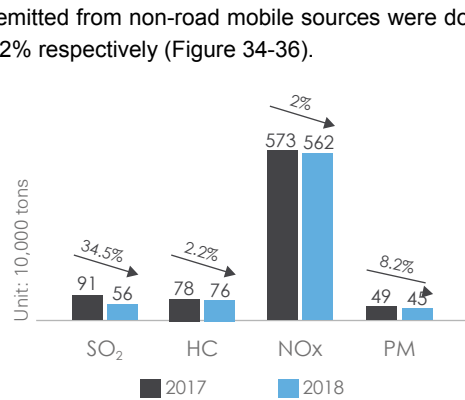


Figure 36 Pollutants Emissions from Non-road Mobile Sources in 2017 and 2018

Year Action Plan. China intends that, by 2020, the production and sales volume of NEVs will reach 2 million. In 2018, the production and sales volume of NEVs was 1.27 million and 1.256 million, up by about 60% respectively from 794,000 and 774,000 registered in 2017. Specifically, megacities which endure severe pollution from mobile sources are the major sales front for NEVs. In 2018, in the five cities with the highest sales volumes of NEVs, emissions from mobile sources are the chief contributor to local PM_{2.5} pollution (Figure 33).

In 2018, the population of NEVs stood at 2.61 million, up by 70% from that of 2017 and accounting for over 50% of the worldwide figure. However, the share of new energy vehicles in China's total motor vehicle population was still very low, at only 1.1%.

The public service sector is a major field in which adoption of new energy vehicles can be promoted. The Three-Year Action Plan proposes that, by the end of 2020, newly-added and renewed buses, sanitation vehicles, mail vehicles, taxis, shuttle buses, and light-duty logistics distribution vehicles in built-up urban areas should see the usage of new energy or clean energy vehicles, and the utilization rate in key regions should reach 80%. By the end of 2018, NEVs amounted to 51% of all buses in China.

Non-road mobile sources became the new focus

As vehicle pollution control measures have been upgraded and tightened, the impact of emissions from non-road mobile sources have increasingly stood out. In 2018, NOx and PM emissions from non-road mobile sources were 5.621 million tons and 445,000 tons, equivalent to emissions from vehicles. China stepped up efforts to control non-road mobile sources in 2018, including expanding low-emission areas for non-road mobile machinery, and expanding and upgrading ship emission control areas. In 2018, levels of SO₂, HC, NOx and PM emitted from non-road mobile sources were down by 34.5%, 2.2%, 2% and 8.2% respectively (Figure 34-36).

Currently, China's non-road mobile machinery adheres to China III emission standards. When it comes to their fuel standard, the content of sulphur in fuel must be less than 10 ppm. It is also a policy requirement that newly produced non-road mobile machinery should have its environmental information released to facilitate management and supervision. In 2018, 574 machinery manufacturers in China made public the environmental information of 5,930 new machinery models via the environmental information disclosure platform.

As for the management of in-use non-road mobile machinery, getting a clear picture of its emissions and designating low-emission zones are both measures that have been adopted to restrict the use of high-emission machinery under China III standards or lower. In 2018, more than 60 cities in China delimited low emission zones for non-road mobile machinery. Figure 37 shows the control measures of low-emission zones for non-road mobile machinery in some cities.

In recent years, China has controlled ship emissions by setting up ship emission control areas (ECA). After ships enter the ECA, the sulphur content of marine fuel, emission standards, and installation and utilization of onshore power should follow the requirements of the ECA, so as to control the emission of PM, SO₂ and NOx from ships.

At the end of 2018, the Ministry of Transport issued a new plan, which expands and upgrades the original ECA. In terms of scope, the original ECA has been extended to cover the sea area and ports within 12 nautical miles of China's territorial sea. Meanwhile, the new plan sets up two inland ECAs, including the navigable waters of the Yangtze River trunk line and Xijiang River trunk line. The new plan also phases in requirements on the installation and utilization of onshore power, as well as NOx emission limits applicable to Chinese-flagged newly-built and rebuilt ships.

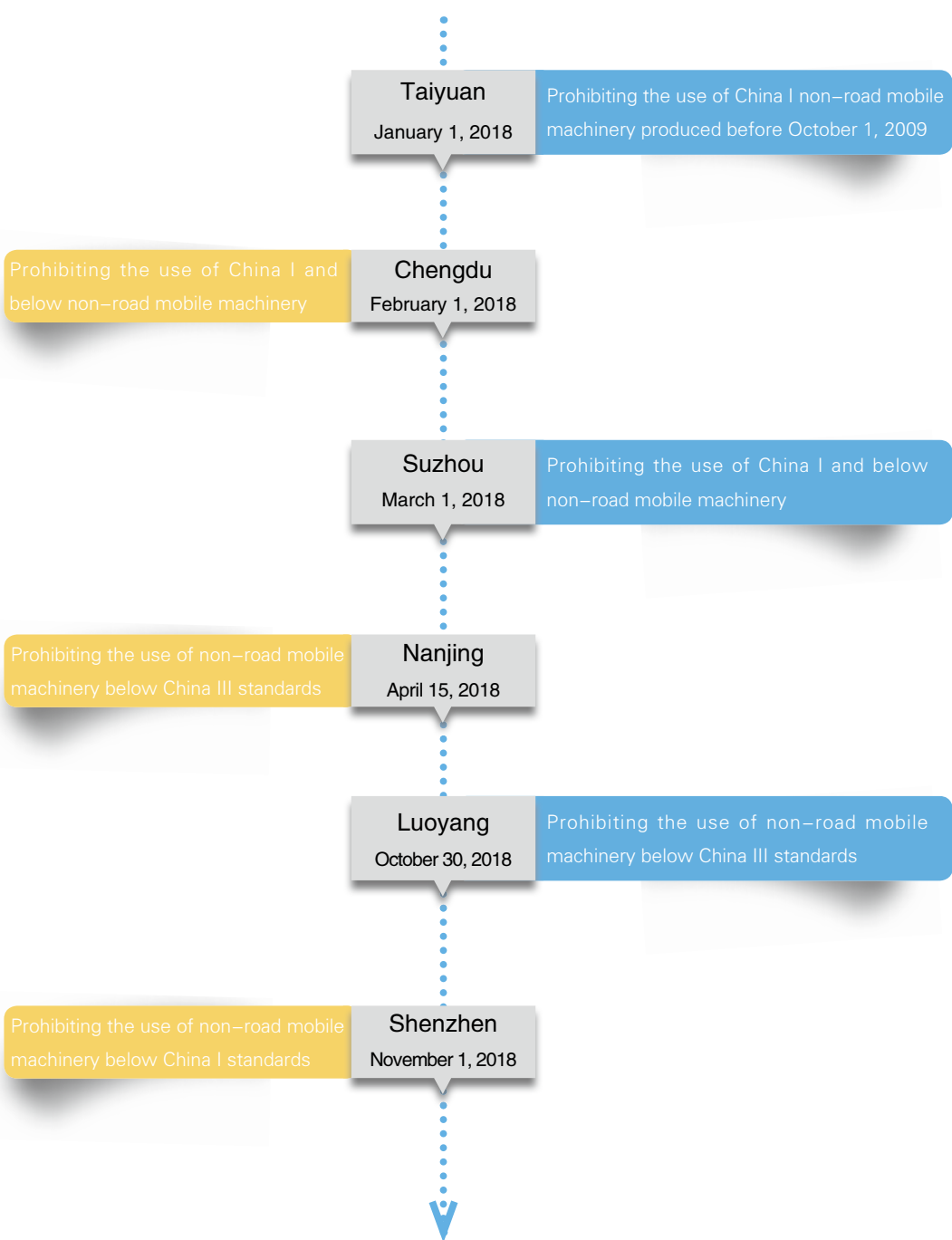


Figure 37 Control Measures of Low-emission Zone of Non-road Mobile Machinery of Some Cities

Pollution control of area sources

Raw coal used for heating by rural households, agricultural open burning and urban fugitive dust are the major sources of area source emissions, but due to their characteristic of disorganized emissions, it is often difficult to control them. Unlike stationary sources and mobile sources, the principal way to address area source pollution lies in enhanced control and supervision.

North China’s winter policy for clean heating was upgraded

In 2017, winter clean heating in North China was initially launched in the first batch of 12 pilot cites, completing the "coal-to-gas" and "coal-to-electricity" transformation of 5.78 million households throughout the year. However, some regions were subject to tight natural gas supply and some households were not warm.

In 2018, the number of pilot cities was increased to 35, completing raw coal control for 4.8 million households. As the total number fell, the technical routes of promotion became more inclusive. Various cities started to implement the coal replacement policy depending on their gas supply capacity. To take Shanxi Province as an example, the share of

coal-to-electricity and other technical routes increased in 2018. The share of coal-to-electricity rose from 5.0% in 2017 to 11.5%, and other heating technical routes such as biomass and solar energy were increased, accounting for 11.1%. The numbers of newly-added households using clean heating in some cities in 2018 are shown in Figure 38.

To avoid a “one size fits all” approach regarding coal replacement, Henan, Liaoning, Shaanxi, Inner Mongolia and Qinghai, among a large number of other provinces and cities, included technical routes for promoting clean coal and the use of environmental-friendly stoves into their clean heating policies. This has allowed regions with rich coal resources to fully capitalize on their resource advantage and introduce clean heating plans suitable for local conditions and follow technical routes welcomed by rural residents.

As the number of rural households meeting the conditions for "coal-to-gas" and "coal-to-electricity" decreases, "double replacement" will enter bottleneck areas, and other regions with inadequate gas resources or network load should thoroughly consider cost-effective technical routes based on local fiscal revenue and other local conditions.

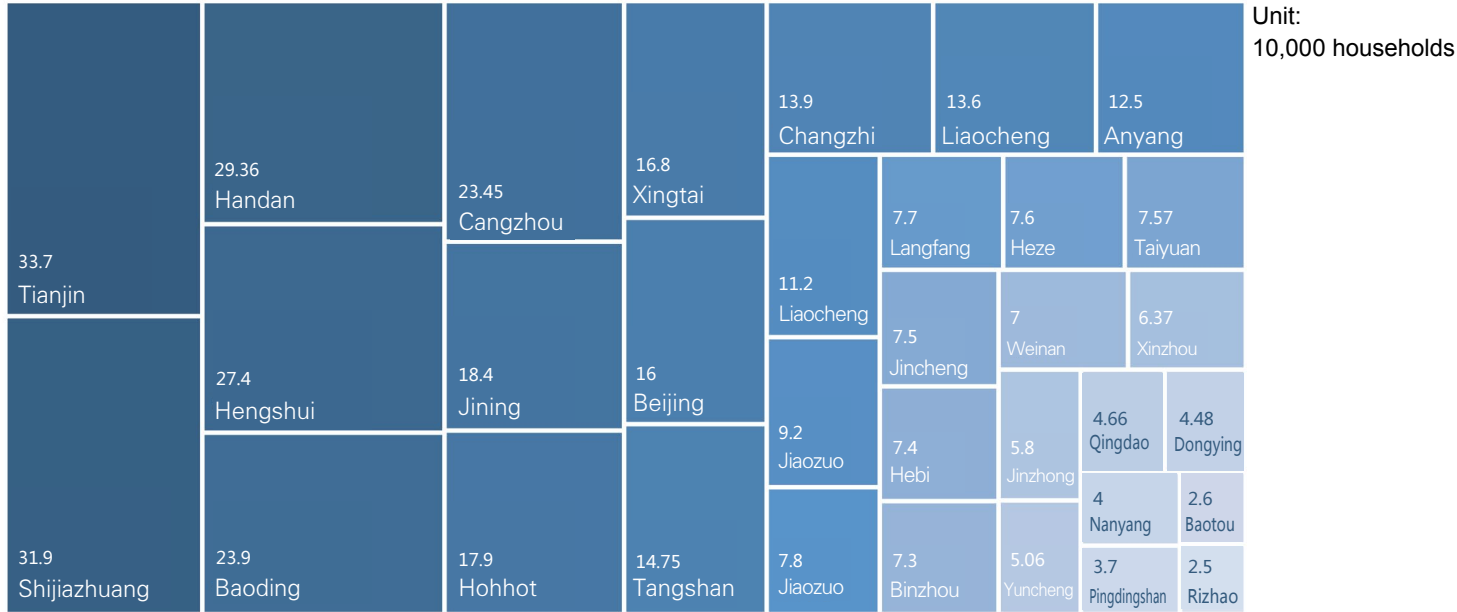


Figure 38 Numbers of Newly-Added Households Using Clean Heating in Some Cities in 2018

New technology and methods facilitated supervision of the open burning of agricultural residue

Open burning of agricultural residue has long been in practice, despite many repeated prohibitions. Given limited human resources within government to supervise widely-distributed farmland, it remains difficult to achieve efficient prohibition of burning. The comprehensive utilization rate of straw cannot be improved swiftly, so supervision cannot be relaxed.

In 2018, Hebei, Henan, Guangxi and other regions started to adopt the blue sky system to realize large-scale high-definition video surveillance and infrared alarms. These methods aimed to ensure panoramic supervision of open burning across the plain areas of an entire province, and address difficulties in discovering open burning sites, slow disposal, punishment imposition and high administrative costs. Since this system was put into operation, Hebei Province located 2,827 burning sites in 2018, and achieved timely discovery and disposal.

When it comes to a supervision model, various cities put in place the grid-based open burning monitoring mechanism. They also strengthened the four-level supervision accountability regime involving city, county, town and village levels, and clarified the responsibilities of local governments at all levels for supervising open burning.

Online PM₁₀ monitoring and video surveillance built up the capacity in fugitive dust supervision

In the later period of the Ten Articles, all provinces and cities brought in precise fugitive dust control. Developing online monitoring and video surveillance platforms and connecting such means of monitoring with government departments has become general practice. However, the online monitoring indicator for construction sites at that time was mainly Total Suspended Particulates (TSP), which was inconsistent with the ambient air quality monitoring indicator. As a result, the micro stations used for hotspot monitoring could not monitor construction sites, making it necessary to establish additional TSP monitoring sites.

At the end of 2017, Fujian Province took the national lead in implementing the “Technical Schedule of Fujian Province for Fugitive Dust Prevention and Control and Monitoring of Construction Sites DBJ/T13-275-2017”, which takes PM₁₀ as the concentration indicator of the online fugitive dust monitoring system and sets the average hourly concentration limit value at 150 µg/m³. In 2018, Nanjing released the “Guide Book of Nanjing for Smart Fugitive Dust Monitoring of Construction Sites (For Trial Implementation),” which takes the concentration value of PM₁₀ at

the monitoring sites as the major indicator for controlling fugitive dust at construction sites and also sets the limit value at 150µg/m³. After that, Hebei Province issued the “Emission Standard for Fugitive Dust of Construction Sites (Draft for Comments),” and the “Technical Specification for the Development and Operation of Online Fugitive Dust Monitoring System (Draft for Comments)” in which fugitive dust of construction sites is directly defined as "PM₁₀ generated from construction sites that has escaped to the ambient air," and the average 10-hour concentration limit of PM₁₀ at construction plants is set to 300 µg/m³.

Taking PM₁₀ as the monitoring indicator for fugitive dust from construction sites made for a good connection with the ambient air quality standard. This has not only enhanced the precise supervision of fugitive dust, but has also proven to be a more cost-effective method of supervision. While conducting grid-based monitoring through the micro stations network, various cities can install micro stations on construction sites to supervise fugitive dust pollution, stations which can be removed to other sites after the completion of construction.

Supporting Measures

Ensuring local governments fulfil their responsibilities when it comes to air quality improvement is at the core of supporting measures. The implementation of the Ten Articles has changed who are considered to be the responsible parties through the target-oriented responsibility system, showing that air pollution control is not just the duty and obligation of environmental protection departments, but that local governments need to take charge of air quality improvement. The central government consolidated responsibility through task decomposition, evaluation, supervision and accountability, so as to make local governments put air pollution prevention and control high on their agenda, and finally achieved general improvement in air quality.

While still continuing this practice, the Three-Year Action Plan makes clear that the main leader is the top person responsible in the administrative region for the Blue Sky Defense Battle. Furthermore, it establishes the mechanisms of quarterly notifications, half-year interviews and annual accountability, and strengthens supervision and reviews of past performance. This has ensured constant pressure and actual policy implementation and rectification.

Financial funds from the central government have increased steadily to support air pollution control, up to RMB 20 billion. These funds aim to pinpoint difficulties in local air pollution prevention and control, especially in the pilot programs of clean heating in North China. In addition, the mechanism for guarding against, and imposing fines on, the falsification of monitoring data is critical to ensuring practical improvement in air quality, and enhanced in the past year.

Reinforced supervision to prohibit lockouts and halts in production during inspections

The MEE has conducted enhanced supervision of air pollution prevention and control in the "2+26" cities since April 2017. The enhanced supervision in key regions listed in the Three-Year Action Plan started in June 2018. A total of 200 supervision teams examined 209 counties/ districts in the BTH Region and its surrounding areas. Five rounds of examinations were conducted in just two months, covering 160,600 enterprises, finding 8,093 stationary emission sources with problems and requiring them to be fixed. In August, the Fen-wei Plains were also selected for enhanced supervision. A total of 90 teams carried out supervision and law enforcement in 83 counties/districts of 11 cities in the region.

During strengthened supervision in 2017, some local governments shut down production enterprises on a large scale. This left many enterprises unable to engage in normal production, incurring economic losses, and were unable to truly put in motion an end to polluting activities. To avoid such scenarios, the MEE pointedly brought in a supplementary policy before the "Looking Back" event in 2018, and issued the "Opinion on Prohibiting "One Size Fits All" Approach in Environmental Protection," banning any and all lockouts and halts in production when supervisors were stationed at the sites.

This has curbed problems resulting from lackadaisical administration and provided structural adjustment opportunities for iron and steel and other major polluting industries. A large number of "small, scattered, unregulated and high-pollution" enterprises were faced with elimination and relocation. The magnitude of remedial actions which followed central environmental supervision released by Shanxi, Tianjin and other regions showed they have largely completed the reform and improvement of projects as required.

In the BTH Region and surrounding areas where air pollution is relatively more severe than other key regions, numerous examples of admonishment about air pollution can be found. The main leaders of cities and districts/counties were admonished for the following reasons.

- ◆ Shanxi Province Government admonished four cities, including Linfen,

- Lvliang, Yuncheng and Taiyuan due to their [failure to reach the target for air quality improvement](#);
- ◆ Hebei Province Government admonished 11 counties because of the [increase rather than decrease in air pollution level](#);
- ◆ Beijing collectively admonished 28 townships, and Henan admonished 10 counties due to their [low ranking in air quality](#);
- ◆ Henan admonished four cities, including Zhumadian, Jiyuan, Xuchang and Anyang, because of a [reduction in their number of attainment days, etc.](#);
- ◆ The MEE and Shanxi Province Government interviewed Linfen for its [falsification of monitoring data](#);
- ◆ [Given salient issues found in supervision and the "Looking Back" event](#), the MEE admonished the governments of Tongzhou District of Beijing, Quyang County of Baoding, Zhaoxian County of Shijiazhuang, Urban Area of Jincheng, and Huixian County of Xinxiang; Shandong Province Government admonished 332 persons, and Jiangxi Province Government admonished 436 persons in the "Looking Back" event.
- ◆ Anhui Province Government admonished Maanshan City and Huangshan City because [their remedial actions and improvements were insufficient in post-supervision assessment](#).

For local governments, the admonishment is a measure with a strong deterrent force. If they do not tackle the relevant problems immediately, and correct them, they may be subject to a series of punitive measures, including being held accountable, limiting approval of environmental assessment projects, and reducing financial support, etc. For example, Handan, which was admonished in May 2018, was barred from being able to increase approvals of environmental assessments of new construction projects concerning air pollutant emissions. To this end, Handan, which often only took actions in autumn and winter, began in the second quarter of 2018 to promote ultra-low emission retrofitting and to implement measures of suspending or restricting production capacities in ten major industries

But it is hard to ignore the fact that the acute administrative pressure of supervision and admonishment has overwhelmed officials in charge of some local administrations. Extreme responses have occurred, including shutdowns enterprises, negatively impacting the local economy. Some officials heading local administrations were found to have falsified data to complete air quality improvement tasks.

Special fund allocated to the difficult and priority areas

Over the years, financial funds from the central government have strongly supported air pollution control in increasing amounts. The figure stood at RMB 20 billion in 2018, and specifically, Hebei Province, Henan Province, Shandong Province, Shanxi Province and Shaanxi Province received the most funding support from the central government. Fund allocation is shown in Figure 39.

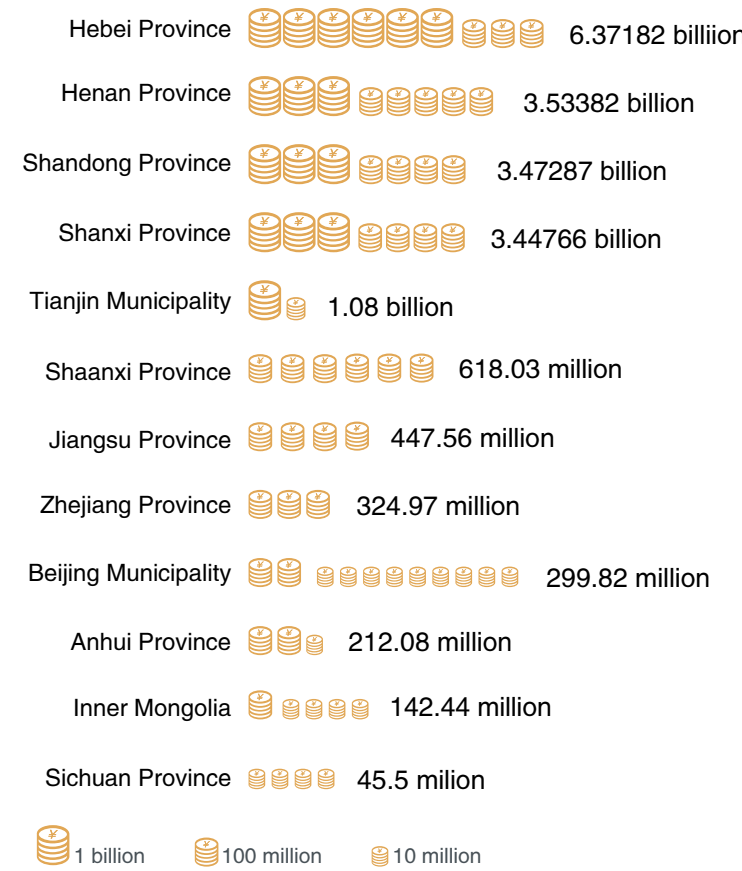


Figure 39 Allocation of Special Funds from the Central Government for Air Pollution Control

Special funds from the central government have effectively alleviated difficulties in local air pollution control, especially in the pilot programs for clean heating in North China. In 2018, the number of pilot cities increased from an initial 12 to 35, and some of the funds for the replacement of coal with clean energy in the BTH Region and its surrounding areas as

well as the Fen-wei Plains came from special funds held by the central government. Each region allocated its incoming finances according to their respective projects addressing local priorities and difficulties. For example, Beijing pooled nearly RMB 20 billion in 2018 to prevent and control air pollution, of which RMB 13.65 billion went to controlling pollution from mobile sources - its top priority. Hebei Province used RMB 6.627 billion to support its rural clean heating transformation, its largest input for a project.

Beijing has considerable economic power, which allows it to promptly address issues with massive investments. In Tianjin, the amount of money locally invested to prevent and control air pollution in 2018 was five times that allocated by the central government, a total of RMB 5.53 billion. Hebei Province, however, relied more on central financial support. In 2018, it obtained RMB 6.372 billion from the central government to prevent and control air pollution, accounting for 31.9% of total special financing from the central government, its largest proportion. Local provincial funds totaled RMB 8.93 billion.

Severe punishments for data falsification to ensure information authenticity

Accurately and honestly announcing air quality data and disclosing enterprises' air pollutant discharge levels to the public are two important ways to disclose information of air pollution prevention and control and encourage public participation. In 2018, the main points on disclosing information were the complete eradication of, and severe punishment for, falsifications. Means to achieve these goals include strengthening control over the quality of monitoring data, punishing improper intervention and falsification in accordance with relevant disciplinary codes and laws, holding officials accountable for information disclosures, and enhancing the credibility of environmental protection.

One typical case of falsifying air quality monitoring data occurred in March 2018 in the city of Linfen, Shanxi Province. The case followed a falsification scandal in Xi'an, and was duly punished according to the law. The scandal itself began when the former director general of Linfen Environmental Protection Bureau urged staff to intervene nearly a hundred times at six state-controlled automatic air monitoring stations. They blocked sampling inlet and sprayed monitoring equipment, leading to the significant distortion of monitoring data in 53 separate instances. The 16 people involved were sentenced to the maximum two years in prison.

Subsequently, Beijing, Shanghai, Jiangsu, Zhejiang, Shandong, Sichuan, Liaoning and other cities issued implementation plans to enhance the quality of environmental monitoring data. The central aim is to constantly enhance mechanisms to guard against and punish falsification of monitoring data, strengthen quality management, supervision and examination of environmental monitoring data, prevent improper intervention in environmental monitoring, and severely punish data falsification.

In June, an enterprise in Jiangxi Province was caught falsifying environmental monitoring data in another textbook case. As a third-party company conducting monitoring on the exhaust emissions of other enterprises, Jiangxi Fengcheng Dongjiang Environmental Protection Co., Ltd helped enterprises falsify data by setting automatic monitoring equipment to maintenance status to avoid monitoring of excessive emissions, leading to a severe distortion of data. This alliance ultimately led to the suspension of production along with remedial actions and corrections for the enterprises involved, as well as the detention of those responsible.

In addition, local governments publicized information on rectifying and solving problems relating to issues of air pollution prevention and control. This enabled relevant parties to understand progress in the field and participate in supervision. In 2018, local governments established the ledger-type and inventory-type management system for central environmental protection supervision to publicize rectification status. Taking Shanxi Province as an example, by September 2018, Shanxi had released a total of 298 reports related to rectification following environmental protection supervision. It publicized and reported rectification progress through TV, newspapers and the internet.

Chapter III.

Assessment of Cities' Air Quality Management



This section provides the air quality management score for 169 key cities (55 cities in the BTH Region and its surrounding areas, 41 cities of the YRD, 11 cities in the Fen-wei Plains, 16 cities of the Chengdu-Chongqing Region, 22 cities in the Urban Agglomeration of Middle Reaches of Yangtze River, 9 cities in the PRD, and 15 other provincial capitals and municipalities with independent planning status) and their ranking. This score and ranking are based on a comprehensive assessment of the degree of air quality improvement and the policies and measures of the 169 key cities. Traditional rankings of cities on air pollution prevention and control is often solely based on air quality data, which has attracted wide attention and inspired cities to make strenuous efforts to improve air quality. But the simple ranking of air quality cannot fully and objectively reflect the efforts made by cities to control air pollution and cannot advise people of the specific areas in which these cities need to improve.

CAA has developed a tool for assessing air quality management based on the air quality management framework. The tool comprehensively evaluates air quality improvement and the implementation of adopted policies and measures, and ranks the cities according to their comprehensive score.

Scoring Method

Our assessment tool grades the cities by two indicators: air quality improvement, and policies and measures. The full mark is 100. Each of the two indicators accounts for 50 points, emphasizing the equal importance of both effort and effect towards air pollution control. In addition to the full marks of 100 points, cities with excellent air quality improvement and pioneering practices in policies and measures may gain extra bonus points. These bonus points will be awarded if cities put forward stricter, and even innovative, local measures and standards in addition to national policies and requirements. Cities admonished by the MEE due to poor efforts in air pollution prevention and control will be subject to point deductions.

Assessment of air quality improvement is further based on two sub-indicators: the range of improvement for the three-year moving average of $PM_{2.5}$ concentrations (i.e., the range of improvement for average $PM_{2.5}$

concentrations in 2016-2018 compared with 2015-2017) and the range of improvement for a three-year moving average of attainment days. The comparison of three-year moving average values reduces the impact of meteorological factors on air quality within a certain year and thus more objectively reflects air quality improvement in recent years. The three-year moving average value of pollutants is also a major indicator used by the United States to evaluate attainment status and divide attainment regions.

The indicator for policies and measures includes five sub-indicators: stationary sources, mobile sources, area sources, capacity building and supporting measures. Each of these further has several sub-items. The score of each sub-indicator is given by assessing the sub-items, and then these sub-indicator scores are finally summed up. Structural figure of the score contents is shown in Figure 40.

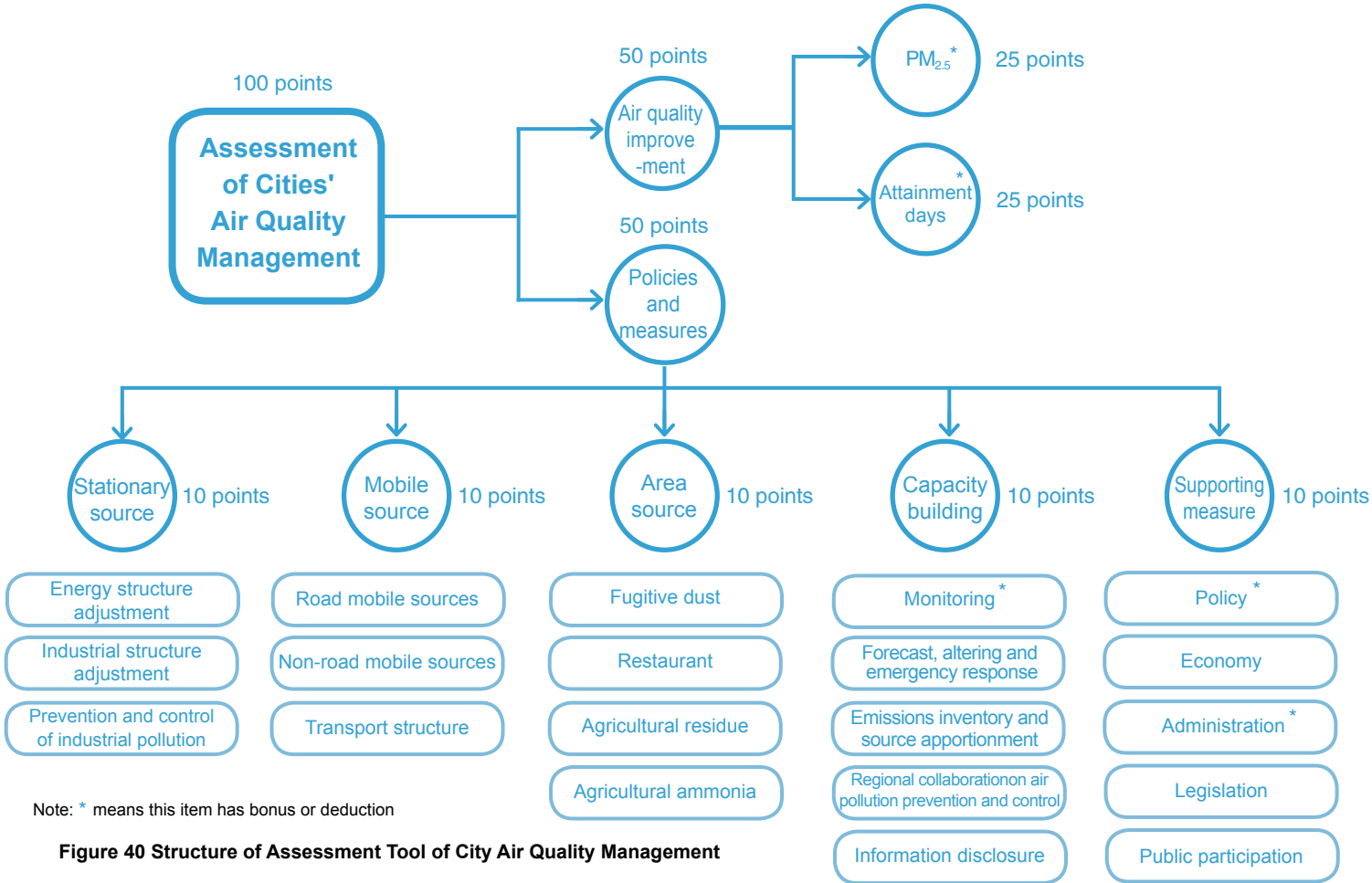


Figure 40 Structure of Assessment Tool of City Air Quality Management

Sample graph of final score is shown in Figure 41.



Figure 41 Sample Graph of Final Score of Assessment Tool

Analysis of Cities’ Score and Ranking

Based on the aforementioned assessment framework, this part ranks and analyzes the two scores of 169 cities: the score for air quality improvement (effect score), and the score for policies and measures (effort score). It seeks to examine achievements and progress made in both air quality improvement and policies and measures. Finally, this report ranks the cities based on their total score achieved through the two indicators.

The list will also recognize cities which excel in both "effort score" and "effect score," especially those cities which already enjoy good air quality yet still work diligently to further improve air quality through enhanced measures. We also hope to motivate cities which demonstrate poor performance in both indicators, especially those with worrying air quality and those making inadequate efforts, in the hope that they will work towards gaining a better grade in future assessments.

Rank	Cities	Air Quality Improvement Score
1	Changchun	61. 5
2	Huangshan	57. 4
3	Dalian	57. 3
4	Lhasa	57. 2
5	Huzhou	56. 1
6	Jiaxing	55. 6
7	Zhoushan	55
8	Wenzhou	54. 8
9	Jinhua	54. 3
10	Shenyang	53. 5
11	Shaoxing	53. 4
12	Hengshui	53. 1
13	Harbin	52. 9
14	Xianning	52. 9
15	Qingdao	52. 8
16	Nantong	52. 6
17	Shanghai	52. 4
18	Yiyang	51. 9
19	Hangzhou	51. 3
20	Haikou	51. 3

Air Quality Improvement

The air quality improvement scoring rules encourage cities that have achieved constant improvements in their air quality. Cities gain a base score under different grades according to their air quality level and acquire bonus points or deductions depending on the degree of improvement or decline. This means that cities which have already complied with air quality standards can obtain a higher score if they make continuous improvements, while cities with poor air quality can boost their score with greater improvement. Conversely, cities with excellent air quality level will have their score reduced if the air quality worsens, while cities with poor air quality which deteriorates still further will surely enter the ranks of the "poorest performers." The scores of air quality improvement for the 169 cities are as follows.

Rank	Cities	Air Quality Improvement Score
21	Meishan	51. 2
22	Suining	51. 2
23	Suzhou	50. 9
24	Xiaogan	50. 7
25	Nanchang	50. 2
26	Wuhan	50
27	Shenzhen	50
28	Nanning	50
29	Jinan	50
30	Dezhou	50
31	Ningbo	50
32	Nanjing	50
33	Yancheng	50
34	Lianyungang	50
35	Guang'an	50
36	Zhuhai	50
37	Chengde	50
38	Lishui	50
39	Liaocheng	50
40	Guiyang	50

Rank	Cities	Air Quality Improvement Score
41	Taizhou	50
42	Jingzhou	50
43	Ezhou	50
44	Ziyang	50
45	Quzhou	50
46	Qinhuangdao	50
47	Kunming	50
48	Baotou	50
49	Xiamen	49. 8
50	Neijiang	49. 8
51	Heze	49. 6
52	Hohhot	49. 5
53	Rizhao	49. 4
54	Suizhou	49. 4
55	Luzhou	49. 2
56	Fuzhou	49
57	Zibo	48. 7
58	Huangshi	48. 7
59	Zhongshan	48. 5
60	Wuxi	48. 3
61	Leshan	48. 2
62	Huanggang	48. 1
63	Datong	48. 1
64	Huai'an	48. 1
65	Jinzhou	48
66	Dazhou	47. 9
67	Xining	47. 8
68	Chongqing	47. 7
69	Zhangjiakou	47. 6
70	Pingxiang	47. 2
71	Dongying	47. 2
72	Jining	47. 1
73	Chaoyang	47. 1

Rank	Cities	Air Quality Improvement Score
74	Jiangmen	47
75	Huizhou	47
76	Huludao	47
77	Foshan	46. 9
78	Guangzhou	46. 6
79	Baoding	46. 4
80	Hefei	46. 4
81	Nanchong	46. 4
82	Jingmen	46. 2
83	Langfang	46. 1
84	Ya'an	45. 7
85	Beijing	45. 5
86	Xinyang	45. 3
87	Zhengzhou	45. 3
88	Changsha	45. 1
89	Pingdingshan	45
90	Zhaoqing	44. 9
91	Xinyu	44. 4
92	Dongguan	44. 4
93	Shuozhou	44. 3
94	Tangshan	44. 1
95	Deyang	43. 9
96	Xinxiang	43. 6
97	Taizhou	43. 3
98	Luohe	43. 2
99	Yinchuan	42. 7
100	Ma'anshan	42. 6
101	Weifang	42. 2
102	Laiwu	42. 1
103	Zhuzhou	42. 1
104	Linyi	42
105	Zhumadian	41. 9
106	Zaozhuang	41. 8

Rank	Cities	Air Quality Improvement Score
107	Changde	41.4
108	Yichun	41.3
109	Tongling	41.3
110	Xingtai	41
111	Xiangtan	40.3
112	Lu'an	40.2
113	Xuchang	40.2
114	Xuancheng	40.2
115	Chuzhou	40
116	Zhoukou	38.8
117	Changzhou	38.2
118	Zhenjiang	38.1
119	Jiujiang	38.1
120	Suqian	38.1
121	Chengdu	37.7
122	Baoji	37.5
123	Yangzhou	37.4
124	Yichang	36.8
125	Sanmenxia	36.5
126	Xiangyang	36.1
127	Anqing	36
128	Wuhu	36
129	Yibin	35.9
130	Handan	35.8
131	Tongchuan	35.6
132	Shangqiu	35.5
133	Yueyang	35
134	Mianyang	34.8
135	Nanyang	34.4
136	Puyang	34.3
137	Zigong	34.1
138	Tai'an	33.1

Rank	Cities	Air Quality Improvement Score
139	Urumqi	33
140	Lanzhou	32.8
141	Jiaozuo	32
142	Binzhou	32
143	Bengbu	31.9
144	Tianjin	31.9
145	Anyang	29.8
146	Cangzhou	27.9
147	Lvliang	27.5
148	Changzhi	26.3
149	Luoyang	26.2
150	Hebi	26.1
151	Shijiazhuang	25.4
152	Xuzhou	23.5
153	Kaifeng	23.4
154	Xinzhou	23
155	Huaibei	23
156	Chizhou	21.2
157	Bozhou	21
158	Suzhou	20.3
159	Jinzhong	20.2
160	Yuncheng	19
161	Fuyang	18.8
162	Huainan	17.6
163	Taiyuan	17.1
164	Yangquan	12.2
165	Xi'an	11.9
166	Jincheng	8
167	Weinan	5.6
168	Xianyang	4.5
169	Linfen	-0.3

Based on their scores for air quality improvement, this report divides the cities into five types: Excellent Cities, Good Cities, Ordinary Cities, Poor Cities and Terrible Cities. The air quality improvement for 169 cities is shown in Figure 42. The distribution in score of all the cities is as follows.

Range of Score	Air Quality Improvement	Number of Cities	Three-year Average Concentration of PM _{2.5} (μg/m ³) in 2016-2018	Average Value of Improvement Rate Compared with 2015-2017	Three-year Average of Attainment Days in 2016-2018	Average Value of Improvement Rate Compared with 2015-2017
>50	Excellent	25	40.20	13.1%	292	5.52%
(45, 50]	Good	63	46.69	8.8%	274	3.40%
(30, 45]	Ordinary	56	56.03	6.6%	242	0.80%
(15, 30]	Poor	19	63.52	2.4%	213	-5.5%
≤15	Terrible	6	69.56	-3.5%	178	-14.5%

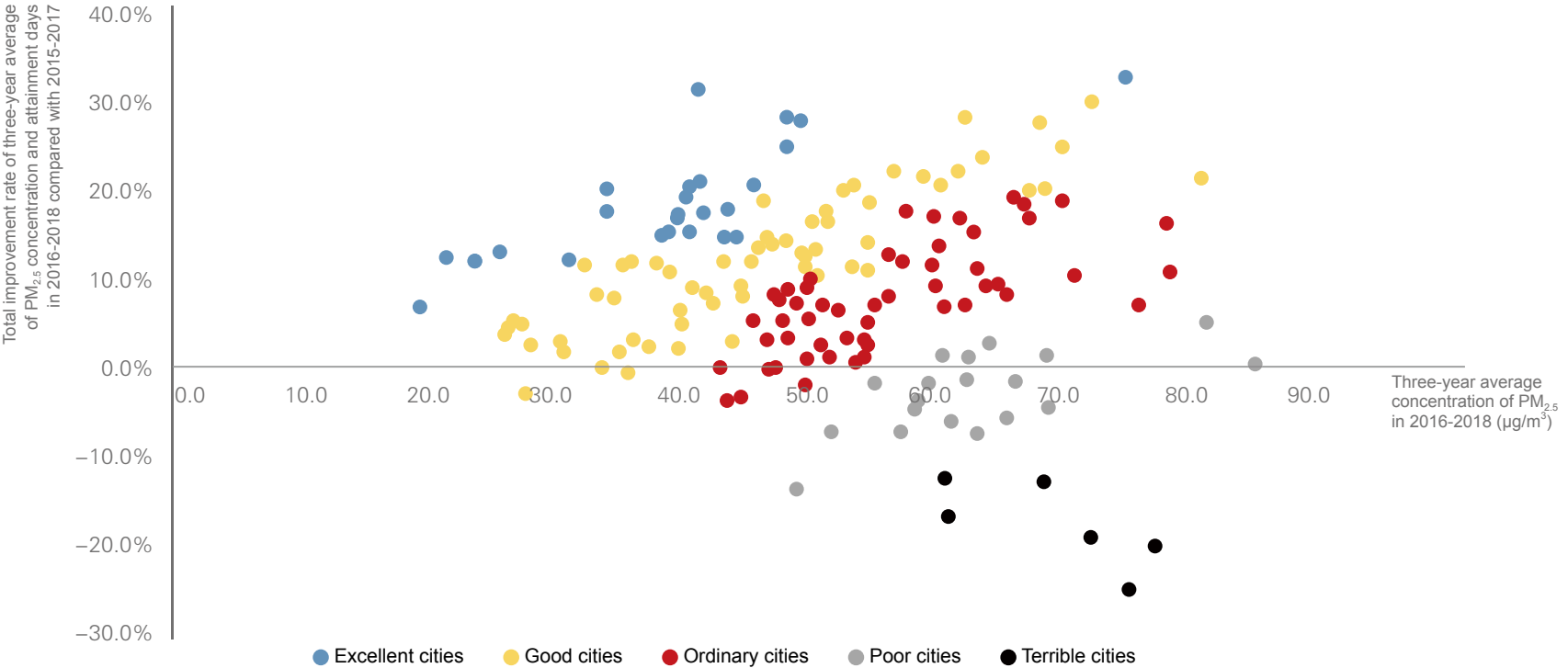


Figure 42 Improvement Rate of Three-year Average of PM_{2.5} Concentration and Attainment Days in 2016-2018 Compared with 2015-2017

Excellent Cities: Cities of the YRD and Northeast China were the heavyweights in air quality improvement

Excellent Cities (score>50) is the title given for cities which comply with air quality standards and still continuously improve, or cities which do not comply with air quality standards yet nonetheless show evident improvement. 25 cities gained bonus points, and their final scores exceeded the full mark of 50. Some 14 cities in Northeast China and the YRD constituted half of all Excellent Cities.

The three provincial capitals of Northeast China (Shenyang, Changchun, Harbin) and Dalian ranked among the top cities, due to their large degree of air quality improvement. Among them, Changchun and Dalian already reached the PM_{2.5} national standard in 2018. The three-year moving average value of PM_{2.5} in Changchun was down from 52.67µg/ m³ in 2015-2017 to 41.67µg/m³ in 2016-2018, an improvement of 20.9%, making Changchun the top scorer. Its attainment days also increased noticeably, with the three-year moving average value up from 268 days to 296 days, improving by up to 10.6%. Based on the analysis results of this series of China Air reports, cities in Northeast China were late starters in air pollution prevention and control, but they have concentrated on the principal problems of local air pollution control in recent years, namely, coal pollution and seasonal open burning of agricultural residues, and thereby achieved solid results by vigorously promoting retrofitting of coal-fired boilers and banning open burning .

As one of the key regions, the YRD realized continuous and stable improvement in air quality through a series of pollution control measures. Although only the YRD cities of Zhoushan, Wenzhou and Jinhua complied with the PM_{2.5} national standard in 2018, no less than 10 cities in the YRD entered the list of Excellent Cities thanks to their large scale improvement in 2016-2018.

Non-industrial cities, such as Huangshan, Lhasa and Haikou, which characteristically had excellent air quality, were also ranked among the Excellent Cities. They had already complied with the PM_{2.5} national standard but were still making improvements in this regard. Among the key cities in the BTH Region and its surrounding areas, only Hengshui made the Excellent Cities list due to its substantial improvement in attainment days.

Good Cities: Cities of the BTH Region and its surrounding areas gained good scores as a result of significant improvements

Good Cities (score: (45–50]) is the title given to cities with excellent air quality improvement or inherently good air quality in recent years while still making slight improvements. This list includes 63 cities. A large number of key cities of the BTH Region and its surrounding areas, and cities in the PRD, achieved this rank. The former cities had poor air quality, but their improvement range on the three–year moving average value of PM_{2.5} exceeded 10% on average. Meanwhile, cities in the PRD with inherently good air quality did not make notable improvements and attainment days even registered a decline in some cities, so no cities of the PRD made the list of Excellent Cities.

Ordinary Cities: Cities in Central and Western China made unsatisfactory air quality improvements

Most Ordinary Cities (score: (30–45]) had a higher three–year average value of PM_{2.5}. Despite general improvement of PM_{2.5}, the improvement in the three–year average of attainment days was not good, and this included most cities of Henan, Anhui and Sichuan and some cities in other provinces in Central and Western China. In addition, cities with satisfactory air quality yet without a trend towards improvement also made it onto the list. For example, Zhaoqing and Dongguan were among the Ordinary Cities because their air quality was largely stable in the past four years. The PM_{2.5} concentration of the two cities was 39µg/m³ and 37µg/m³ in 2018, slightly higher than national standard.

Poor Cities: Poor Cities were mainly located in Shanxi and Anhui which often severely exceeded the standards

Poor Cities (score: (15–30]) are mainly cities with poor air quality improvement or cities which substantially exceed air quality standards and have demonstrated almost no improvement. Among the 19 Poor cities, Shanxi and Anhui each had six cities, and the other cities were in Henan and Hebei. Their improvement rate on their PM_{2.5} three–year moving average was only 2.4% on average. Among these cities, the three–year moving average value of PM_{2.5} worsened by 7.2% in Chizhou.

Terrible Cities: Cities of the Fen-wei Plains saw greatly worsening air quality and entered the ranks of the "poorest performers"

Terrible Cities (score <15): Our results show that six cities scored less than 15, and so found their way on to the list of Terrible Cities. Three of these cities are in Shanxi Province (Linfen, Jincheng and Yangquan), and three in Shaanxi Province (Xianyang, Weinan and Xi'an). All of them are "2+26" cities or cities of the Fen–wei Plains under close attention.

The three years from 2015 to 2017 were the years during which the Ten Articles gained ground in implementation. During this period, cities across the country saw improved air quality on the whole, and the BTH Region showed evident efficacy as a key region. Unfortunately, the air quality in cities on the Fen–wei Plains worsened significantly over that same period. In 2017, Linfen, Xianyang, Xi'an and Weinan were all included on the list of 15 Poorest Cities for air quality, and their average mean concentration of PM_{2.5} exceeded the standard by 100%. In 2015, they did not even enter the list of 50 Poorest Cities. In 2018, cities of the Fen–wei Plains

Policies and Measures

The score for policies and measures covers the emission reduction measures taken by cities to control emissions from stationary sources, mobile sources and area sources. It also includes capacity building

Rank	Cities	Score of Policies and Measures
1	Beijing	53.67
2	Tianjin	52.87
3	Guangzhou	52.6
4	Shanghai	52.5
5	Wuhan	51.66
6	Shenzhen	51.17
7	Chengdu	51.16
8	Qingdao	50.66
9	Hangzhou	50.16
10	Chongqing	50.11
11	Zhengzhou	50.01
12	Fuzhou	49.87
13	Nanning	49.72
14	Harbin	49.67
15	Jinan	49.66
16	Changzhou	49.19
17	Shijiazhuang	49.16
18	Foshan	49.02
19	Changsha	49.01
20	Langfang	48.97
21	Lanzhou	48.9
22	Wenzhou	48.82

saw some moderation of their worsening situation after being included in the new key region required by the Three–year Action Plan, but their three–year moving average values of PM_{2.5} were higher than most cities, and their attainment days were down by 14.5% on average. Linfen was the only city with a negative score and it ranked last because of severe worsening in the three–year moving average value for both PM_{2.5} and attainment days.

measures to support scientific policy implementation, and supporting measures to promote the effective implementation of policies.

Rank	Cities	Score of Policies and Measures
23	Xiamen	48.79
24	Jinzhong	48.63
25	Changchun	48.34
26	Dezhou	48.29
27	Haikou	48.2
28	Ningbo	48.18
29	Luzhou	48.17
30	Xi'an	48.08
31	Zhenjiang	48.04
32	Changzhi	47.972
33	Lvliang	47.89
34	Leshan	47.81
35	Dalian	47.8
36	Nanchang	47.71
37	Zibo	47.662
38	Neijiang	47.49
39	Urumqi	47.49
40	Nanjing	47.47
41	Taiyuan	47.412
42	Tangshan	47.38
43	Jining	47.36
44	Nantong	47.35

Rank	Cities	Score of Policies and Measures
45	Baoding	47.29
46	Suzhou	47.2
47	Deyang	47.06
48	Hefei	47.04
49	Jiangmen	46.92
50	Yinchuan	46.85
51	Xuzhou	46.79
52	Yancheng	46.7
53	Xingtai	46.66
54	Hebi	46.63
55	Yibin	46.49
56	Dongguan	46.47
57	Zaozhuang	46.46
58	Zhuzhou	46.42
59	Shenyang	46.37
60	Meishan	46.35
61	Lianyungang	46.35
62	Huizhou	46.29
63	Xinzhou	46.27
64	Shuozhou	46.23
65	Shaoxing	46.22
66	Guang'an	46.22
67	Xianyang	46.18
68	Zhongshan	46.14
69	Xiangyang	46.13
70	Zhuhai	46.07
71	Dazhou	46.02
72	Huainan	45.98
73	Huangshi	45.92
74	Chengde	45.882
75	Jinhua	45.84
76	Mianyang	45.83

Rank	Cities	Score of Policies and Measures
77	Yueyang	45.78
78	Changde	45.57
79	Jiaozuo	45.55
80	Hohhot	45.44
81	Lishui	45.2
82	Liaocheng	45.17
83	Guiyang	45.17
84	Tongchuan	45.17
85	Luoyang	45.17
86	Suining	45.1
87	Huanggang	45.1
88	Taizhou	45.07
89	Rizhao	45.05
90	Linyi	45.05
91	Cangzhou	45.04
92	Nanyang	45.02
93	Jiaxing	44.86
94	Sanmenxia	44.86
95	Xining	44.85
96	Jiujiang	44.85
97	Zhangjiakou	44.8
98	Datong	44.73
99	Xiangtan	44.68
100	Wuxi	44.66
101	Anqing	44.62
102	Tai'an	44.62
103	Tongling	44.61
104	Huangshan	44.6
105	Zhaoqing	44.52
106	Huai'an	44.51
107	Heze	44.487
108	Xinxiang	44.47

Rank	Cities	Score of Policies and Measures
109	Weinan	44.42
110	Yichang	44.34
111	Lu'an	44.3
112	Jingmen	44.27
113	Yangzhou	44.27
114	Taizhou	44.23
115	Chizhou	44.21
116	Shangqiu	44.18
117	Xinyu	44.17
118	Jingzhou	44.14
119	Huludao	44.14
120	Weifang	44.12
121	Puyang	43.99
122	Ezhou	43.95
123	Binzhou	43.93
124	Luohe	43.9
125	Ma'anshan	43.9
126	Chuzhou	43.8
127	Bengbu	43.77
128	Yangquan	43.76
129	Pingdingshan	43.75
130	Ziyang	43.7
131	Wuhu	43.7
132	Xinyang	43.66
133	Xuchang	43.56
134	Hengshui	43.55
135	Baoji	43.55
136	Pingxiang	43.54
137	Quzhou	43.48
138	Linfen	43.46
139	Zhoushan	43.43

Rank	Cities	Score of Policies and Measures
140	Yiyang	43.43
141	Jincheng	43.36
142	Jinzhou	43.35
143	Ya'an	43.33
144	Suqian	43.33
145	Bozhou	43.29
146	Suzhou	43.24
147	Laiwu	43.21
148	Zigong	43.2
149	Fuyang	43.19
150	Qinhuangdao	43.15
151	Handan	42.86
152	Anyang	42.58
153	Zhoukou	42.54
154	Kaifeng	42.53
155	Nanchong	42.42
156	Xuancheng	42.36
157	Huzhou	42.24
158	Xianning	42.18
159	Kunming	41.74
160	Suizhou	41.49
161	Yichun	41.4
162	Xiaogan	41.33
163	Zhumadian	41.18
164	Baotou	41.12
165	Dongying	41.12
166	Chaoyang	41.07
167	Yuncheng	40.99
168	Huaibei	40.3
169	Lhasa	40.1

The distribution of score of all the cities is as follows:

Range of Score	Performance	Number of Cities
>50	Excellent	11
(45, 50]	Good	81
(40, 45]	Ordinary	77

Considering that cities formulate policies for air pollution prevention and control based on the national action plan, which are then included in the government performance evaluation and accountability system, their policies tend to be similar. This means that the scores for policies and measures range from approximately 40 to 50. Given the limited information and data available from public sources, the assessment of a city's policies and measures faces difficulties in reflecting the actual state of practical implementation and inter-city implementational differences. But the assessment results effectively recognize the degree of completeness of the air quality management framework and the comprehensiveness of measures adopted by cities.

The score of policies and measures is assessed according to the latest implementation statuses available for 2018, so the correlation with the improvement range for the three-year moving average may be out of sync. This is particularly true for cities in the Fen-wei Plains. These cities were included in a new key region from 2018 due to their worsening air quality and have subsequently adopted more policies and measures than those in non-key regions and thus gained better scores. But the effect of these measures in air quality improvement will only become evident in assessments made in later years.

Excellent Cities: First-tier cities demonstrated outstanding strength, and Beijing topped the list for policies and measures

The assessment results indicate a total of 11 cities achieved scores above the full mark of 50 and showed excellent performance in implementing policies and measures for air pollution prevention and control, with Beijing's outstanding performance ranking first. These cities are traditional first-tier cities and emerging first-tier cities experiencing high levels of economic development. Nine of them ranked among the top 10 in GDP in 2018. The general traits of these cities include strong fiscal capacity, research ability and high levels of planning, which together enables them to inject comparatively more resources towards improving air quality than other cities. In addition, they also have great technological "hard power" and the "soft power" of capacity.

Some pioneering measures taken by these cities were either not required by national policy or were the kind of measures for which other cities lacked the resources to adopt in 2018. As a result, they gained corresponding bonus points for measures which included:

- Establishment of an air quality monitoring super station
- Development of an emissions inventory and conducting of source apportionment that is actively updated and establishment of a local emission factors database
- Establishment of a bus rapid transit (BRT) system
- Engagement in international cooperation in air pollution control
- Formulation of local regulations on air pollution prevention and control
- Assessment of the cost effectiveness of the municipal action plan for air pollution prevention and control

This indicates that active promotion of scientific research, engagement in cooperation and initiative in adopting more advanced practices ahead of national requirements are important characteristics for distinguishing pioneering cities from the rest. Furthermore, these cities place more significance on scientifically founded control of air pollution, which has allowed them to steadily improve air quality even when the potential for emission reductions has been constantly reduced.

Good Cities: Cities in key regions generally implemented more comprehensive measures for air pollution prevention and control

A total of 81 cities gained scores ranging from 45 to 50. They are situated in key regions for air pollution prevention and control, including the BTH Region and its surrounding areas, the YRD, the PRD and the Fen-wei Plains. Some provincial capitals are also among the 81 cities. While these cities do not match first-tier cities in benchmarks such as fiscal strength, they have attracted more attention from central and provincial governments. Likewise, while they may lack competitiveness with first-tier cities on the criteria for pioneering practices, they have nonetheless achieved superior results when judged on other measures.

However, these cities still need to improve the following:

- Inadequate information disclosure: energy structure data, transport structure data and data on pollutant concentration. In some cities, such data is not available through official open sources
- Failure to retrofit diesel vehicles
- Failure to control vessel pollution in inland rivers
- Failure to develop an emissions inventory and conduct source apportionment, or failure to update it in a dynamic way, or failure to

establish a local emissions factor database

- Failure to develop local air quality attainment plans
- Failure to control vehicle population
- Failure to establish micro-stations to conduct grid monitoring to identify hotspots on air quality

Broadly speaking, cities with higher scores for policies and measures recorded greater improvements in air quality than their low-scoring counterparts. It is worth noting that four cities in Northeast China, which are on the list of those achieving excellent air quality improvements, also ranked high in this regard. Harbin, Changchun and Dalian are among the top-positioned cities and have implemented comprehensive emission reduction measures regarding key pollution sources. To further improve long term air quality, it is essential they learn from pioneering cities. They must strengthen the foundations for science-based pollution control, formulate long-term planning, and implement tougher emission reduction measures.

Some cities in Shanxi province did adopt tough control measures, as they were included as key regional cities in the Three-Year Action Plan, but bad air quality and poor performance in improvement made them on the list of terrible cities under the effect score.

Ordinary Cities: Cities in Henan were typical cities with ordinary scores in policies and measures and poor air quality

Another 77 cities recorded scores which ranged from 40 to 45. They are small and medium-sized cities, where policy mechanisms for air quality management are incomplete, leaving significant potential for improvement.

Specifically, seven cities, including Zhangjiakou, Huangshan, Quzhou, Zhoushan, Yiyang, Kunming and Lhasa, complied with the PM_{2.5} standards for air quality. As they are not industrialized cities and it is not required for them to introduce stricter pollution control measures, their scores for measures are ordinary. But because of these cities' natural advantages in location, the air quality has been excellent and they have gained a high base score in air quality.

However, most cities with ordinary scores for policies and measures had unsatisfactory air quality. Among the 20 cities with ordinary scores having the highest concentrations of PM_{2.5} in 2018, 11 were in Henan Province. The annual average concentration of PM_{2.5} for Anyang, Kaifeng, Pingdingshan, Puyang, Xuchang, Shangqiu, Xinxiang, Luohe and Zhumadian all exceeded 60 µg/m³ in 2018, far surpassing the standard. Beyond that, Yangquan, Jincheng, Linfen and Handan were admonished

by the MEE for poor performance in air quality management, and were subject to score deductions.

Failures which led to point deductions from Good cities also apply to Ordinary Cities. In addition, the Ordinary cities are suggested to improve the following:

- Failure to set up targets for total coal consumption control, or failure to realize targets
- Failure to engage in regional collaboration on air pollution prevention and control with surrounding cities
- Failure to develop a dedicated website for the ecology and environment bureau
- Failure to publicize the Report on the State of Ecology and Environment, or failure to reveal data on concentrations of the six pollutants in the Report
- Greening rate of built-up areas lower than the country's average level

Analysis of the Cities' Comprehensive Score on Air Quality Management

The comprehensive score on cities' air quality management is the sum of two scores: that of air quality improvement and that of policies and measures. It reflects the effect and effort of cities in a far-reaching manner. Specifically, the score of air quality improvement can be seen as the "effect score" which is mainly the result of cumulative measures undertaken in the past years. The score of policies and measures can be regarded as the "effort score," which will also serve as the harbinger for continuous and long-term improvement in air quality and become the basis that determines the "effect score" in future assessments. Apart from a few cities with good natural advantages, only by gaining a higher "effort score" can cities consistently ensure excellence in their "effect scores." The comprehensive assessment score is designed to encourage cities to take active measures in air pollution prevention and control, and it fully recognizes the outcome achieved in air quality improvement.

Based on the scores of air quality improvement and policies and measures, the comprehensive scores on air quality management for the 169 cities are as follows.

Rank	Cities	Total Points
1	Changchun	109.84
2	Dalian	105.10
3	Shanghai	104.90
4	Wenzhou	103.62
5	Qingdao	103.46
6	Harbin	102.57
7	Huangshan	102.00
8	Wuhan	101.66
9	Hangzhou	101.46
10	Shenzhen	101.17
11	Jiaxing	100.46
12	Jinhua	100.14
13	Nantong	99.95
14	Shenyang	99.87
15	Nanning	99.72
16	Jinan	99.66
17	Shaoxing	99.62
18	Haikou	99.50
19	Beijing	99.37
20	Guangzhou	99.20
21	Fuzhou	98.87
22	Xiamen	98.59
23	Zhoushan	98.43
24	Huzhou	98.34
25	Dezhou	98.29

Rank	Cities	Total Points
26	Ningbo	98.18
27	Suzhou	98.10
28	Nanchang	97.91
29	Chongqing	97.81
30	Meishan	97.55
31	Nanjing	97.47
32	Luzhou	97.37
33	Lhasa	97.30
34	Neijiang	97.29
35	Yancheng	96.70
36	Hengshui	96.65
37	Zibo	96.36
38	Lianyungang	96.35
39	Suining	96.30
40	Guang'an	96.22
41	Zhuhai	96.07
42	Leshan	96.01
43	Foshan	95.92
44	Chengde	95.88
45	Yiyang	95.33
46	Zhengzhou	95.31
47	Lishui	95.20
48	Liaocheng	95.17
49	Guiyang	95.17
50	Xianning	95.08

Rank	Cities	Total Points
51	Langfang	95.07
52	Taizhou	95.07
53	Hohhot	94.94
54	Zhongshan	94.64
55	Huangshi	94.62
56	Jining	94.46
57	Rizhao	94.45
58	Changsha	94.31
59	Jingzhou	94.14
60	Heze	94.09
61	Ezhou	93.95
62	Jiangmen	93.92
63	Dazhou	93.92
64	Ziyang	93.70
65	Baoding	93.69
66	Quzhou	93.48
67	Hefei	93.44
68	Huizhou	93.29
69	Huanggang	93.20
70	Qinhuangdao	93.15
71	Wuxi	92.96
72	Datong	92.83
73	Xining	92.65
74	Huai'an	92.61
75	Zhangjiakou	92.40
76	Xiaogan	92.03
77	Kunming	91.74
78	Tangshan	91.68
79	Jinzhou	91.35
80	Deyang	91.16

Rank	Cities	Total Points
81	Huludao	91.14
82	Baotou	91.12
83	Suizhou	90.89
84	Dongguan	90.87
85	Pingxiang	90.74
86	Shuozhou	90.63
87	Jingmen	90.47
88	Yinchuan	90.05
89	Zhaoqing	89.52
90	Xinyang	89.16
91	Xinyu	89.07
92	Chengdu	88.86
93	Pingdingshan	88.85
94	Nanchong	88.82
95	Zhuzhou	88.52
96	Xinxiang	88.37
97	Zaozhuang	88.36
98	Dongying	88.32
99	Chaoyang	88.17
100	Xingtai	87.86
101	Taizhou	87.83
102	Changzhou	87.39
103	Changde	87.37
104	Luohe	87.20
105	Linyi	87.15
106	Weifang	86.72
107	Ma'anshan	86.60
108	Zhenjiang	86.14
109	Tongling	85.91
110	Laiwu	85.41

Rank	Cities	Total Points
111	Xiangtan	84.98
112	Tianjin	84.77
113	Lu'an	84.50
114	Ya'an	84.33
115	Chuzhou	83.80
116	Xuchang	83.76
117	Zhumadian	83.18
118	Jiujiang	82.95
119	Yichun	82.80
120	Xuancheng	82.56
121	Yibin	82.39
122	Xiangyang	82.23
123	Lanzhou	81.70
124	Yangzhou	81.67
125	Suqian	81.43
126	Sanmenxia	81.36
127	Zhoukou	81.34
128	Yichang	81.14
129	Baoji	81.05
130	Yueyang	80.78
131	Tongchuan	80.77
132	Mianyang	80.63
133	Anqing	80.62
134	Urumqi	80.49
135	Wuhu	79.70
136	Shangqiu	79.68
137	Nanyang	79.42
138	Handan	78.66
139	Puyang	78.29
140	Tai'an	77.72

Rank	Cities	Total Points
141	Jiaozuo	77.55
142	Zigong	77.30
143	Binzhou	75.93
144	Bengbu	75.67
145	Lvliang	75.39
146	Shijiazhuang	74.56
147	Changzhi	74.27
148	Cangzhou	72.94
149	Hebi	72.73
150	Anyang	72.38
151	Luoyang	71.37
152	Xuzhou	70.29
153	Xinzhou	69.27
154	Jinzhong	68.83
155	Kaifeng	65.93
156	Chizhou	65.41
157	Taiyuan	64.51
158	Bozhou	64.29
159	Huainan	63.58
160	Suzhou	63.54
161	Huaibei	63.30
162	Fuyang	61.99
163	Yuncheng	59.99
164	Xi'an	59.98
165	Yangquan	55.96
166	Jincheng	51.36
167	Xianyang	50.68
168	Weinan	50.02
169	Linfen	43.16

The distribution of total score of all the cities is as follows:

Range of Score	Performance	Number of Cities
>100	Excellent	12
(85, 100]	Good	98
(70, 85]	Ordinary	42
(60, 70]	Poor	10
≤ 60	Terrible	7

Excellent Cities: Three cities made the list of "double excellence", and Changchun had the highest total score

A total of 12 cities scored higher than the full mark of 100 by gaining bonus points. These cities are Changchun, Dalian, Shanghai, Wenzhou, Qingdao, Harbin, Huangshan, Wuhan, Hangzhou, Shenzhen, Jiaxing and Jinhua, ranked from high to low. Their scores in air quality improvement were relatively high, and 80% of them had scores for policies and measures at levels of good and above. Specifically, Shanghai, Qingdao and Hangzhou were cities with both "effort score" and "effect score" on the list of excellent cities, and Shenzhen and Wuhan also achieved grades which were very close to "double excellence." The annual mean concentration of PM_{2.5} for Qingdao and Shenzhen complied with the national standard, and Shanghai also neared the standard in 2018. Changchun, Dalian and Harbin scored high due to their large degrees of air quality improvement, and Changchun achieved the highest total score.

Good Cities: Most cities were "Good" cities, with satisfactory air quality management in general

China has promoted strong policies and measures for air pollution prevention and control in recent years, and widely improved air quality. Therefore, most cities demonstrated good performance in both effort and effect. Up to 98 cities are on the list of Good Cities, the most of any bracket, with scores ranging from 85 to 100.

Five cities made it onto the list after gaining bonus points resulting from their excellent performance in policies and measures, including Beijing, Guangzhou, Chengdu, Chongqing and Zhengzhou. Beijing, Chongqing and Zhengzhou have greatly improved air quality since 2015, however their failure to achieve the standard for annual mean concentration of PM_{2.5} affected their scores. These cities will be able to boost their effect score with continuous efforts in the future.

15 cities were ranked on the ‘Good Cities’ list because of significant improvements in air quality, including Haikou, Zhoushan, Nanchang,

Lhasa, and Yiyang, who all complied with the PM_{2.5} standard. These 15 cities did not achieve excellent scores in policies and measures, but half of them did still obtain good scores. Other cities were on the list because of their degree in air quality improvement, especially those cities of the YRD which showed outstanding improvement.

Ordinary Cities: Tianjin and Shijiazhuang scored high on policies and measures, but their three-year moving average of air quality attainment days worsened year on year and reduced their rankings

A total of 42 cities recorded scores ranging from 70 to 85. Their performance in air quality improvement was generally ordinary or poor, and most of them also had unsatisfactory scores in policies and measures. Of these cities, only Tianjin’s score on policies and measures entered the excellent list, with Shijiazhuang second highest. But Shijiazhuang’s low improvement score of 25.4, resulting from its reduced number of air quality attainment days, brought down its overall ranking. As early representative cities in efforts to prevent and control air pollution, Lanzhou and Urumqi gained good scores in policies and measures.

Poor cities: Three cities in Anhui Province demonstrated generally poor performance with worrying air quality

10 cities had a total score ranging from 60 to 70. The air quality scores of these cities were also poor, and more than half of them were in the bottom bracket for their scores on policies and measures too. Cities with the poorest comprehensive performance included Suzhou, Huaibei and Fuyang, all of which are in Anhui Province. In particular, the PM_{2.5} annual average concentration worsened steadily in Fuyang from 2015 to 2017 and only started improving in 2018.

Terrible Cities: Cities in Shanxi and Shaanxi performed terribly, and Linfen’s total score ranked last

Seven cities received terrible scores. They are Linfen, Weinan, Xianyang, Jincheng, Yangquan, Xi'an and Yuncheng, ranked from low to high. Their scores on air quality improvement were very low, and all of them were among the "poorest performers" in the 2018 air quality ranking released by MEE. The last-placed city, Linfen, gained a negative score because of its overly high rate of worsening air quality. Among these cities, Xi'an had the highest score on policies and measures at 48.1, while the scores on policies and measures registered by the cities of Yuncheng and Weinan were both relatively low.